THE NARDA MICROWAVE CORPORATION

TECHNICAL MANUAL
OPERATING AND MAINTENANCE INSTRUCTIONS

FOR

MODEL 61A1B
ATTENUATION CALIBRATOR

Equipment Serial Number 03036

98210082

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SECTION I

GENERAL DESCRIPTION

1-1. INTRODUCTION.

1-2. This manual contains complete instructions for the operation and maintenance of the Narda Model 61A1B ATTENUATION CALIBRATOR designed and manufactured by The Narda Microwave Corporation, Plainview, New York 11803. The manual includes a general description of the equipment, operating instructions, theory of operation, maintenance procedures and a replaceable parts list.

1-3. DESCRIPTION. (See figure 1-1.)

1-4. The Narda Model 61A1B ATTENUATION CALIBRATOR is a unique and versatile unit designed for use with standard coaxial and waveguide instruments. It is capable of performing highly accurate attenuation and power measurements, and can also be used as a calibration source for signal generators; attenuation measurements over the frequency range of 10 MHz to 40 GHz, over a dynamic range of 100dB in a single step, and power measurements over a range of 120dB with calibration by means of an auxiliary step attenuator. Absolute r-f

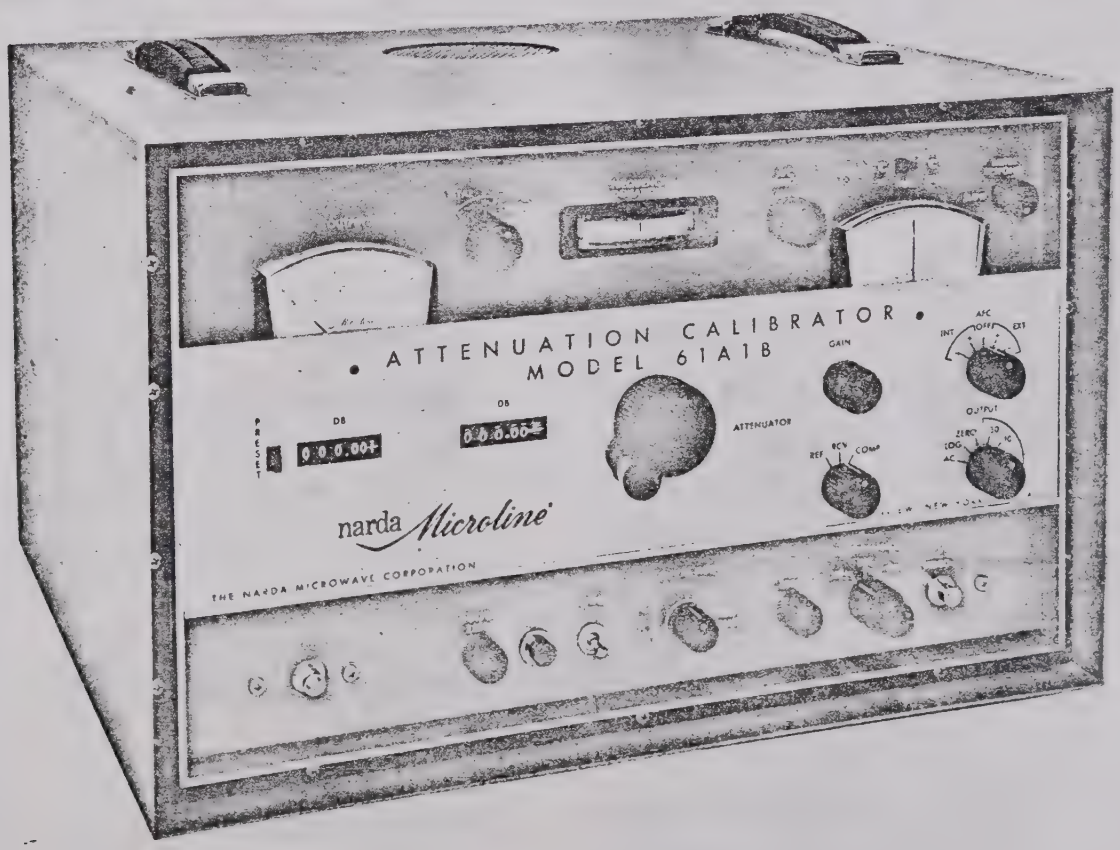


Figure 1-1. Narda Model 61A1B ATTENUATION CALIBRATOR

power levels as low as -117dBm are possible where the signal is capable of being 100 percent-modulated with the internally generated squarewave or cw signals using the internal switch mode and noise generator. In addition the Calibrator may also be used as a conventional lin-log receiver. For antenna pattern measurements, a 50-dB log scale and recorder output are provided. In conventional linear operation, the unit can be used as an extremely sensitive microwave detector.

1-5. SPECIFICATIONS.

1-6. Table 1-1 lists the specifications for the Model 61A1B ATTENUATION CALIBRATOR.

Table 1-1

Specifications

Frequency Range	10 MHz to 40 GHz			
Input Frequency	30 MHz			
Input Impedance	100 ohms Nominal at 30 MHz			
Accuracy	Attenuation (dB)	Maximum Error (dB)	Attenuation* (dB)	Maximum Error (dB)
Single Step	10	±0.05	60	±0.25
	20	±0.06	70	±0.30
	30	±0.08	80	±0.35
	40	±0.13	90	±0.40
	50	±0.18	100	±0.50

Incremental Attenuation	Input Level (dBm)	Maximum Error dB/10dB
	-17 to -32	±0.12
	-32 to -87	±0.04
	-87 to -102 *	±0.12
	-102 to -117 *	±0.20

*Microwave source externally switched or internal with internal noise.

Null Resolution	
High Sensitivity Position	0.008dB per division to -100dBm
	0.05dB per division to -117dBm

Table 1-1 (Cont)

Low Sensitivity Position	0.08dB per division to -100dBm 0.5dB per division to -117dBm
I-F Amplifier:	
Center frequency	30 MHz
Bandwidth	1 MHz
Overall effective noise figure (including input switch)	3dB maximum
Gain variation	65dB minimum
Reference Oscillator:	
Frequency	30 MHz ±0.02%, crystal controlled
Amplitude Stability	0.005dB per 10 minutes, maximum
Output level	0.8V RMS, minimum, into 50 ohms
30 MHz Attenuator type:	
Range	130dB, minimum
Insertion loss	23 ±0.5dB at zero
Accuracy	0.05dB/10dB change, 0.1dB maximum cumulative error 0.03dB/10dB change for 20 to 70 dB range
Receiver Mode Output Level Indicator:	
DC video ranges	1, 3, 10 and 30 volts full scale
Log DC video	Range, 0 to 50dB at 20 volts full scale nominal
AC video	10 volts rms full scale
Mixer crystal current	Range, 0 to 3mA, positive or negative polarity
Automatic Frequency Control:	
Correction Voltage Range	±25 volts centered on input reflector voltage
Correction Current Range	±20mA
Phase	Plus or minus, selectable by a front panel control
Insulation	5000 volts minimum, beam or reflector
Loop Gain	Adjustable by rear panel control
Signal Level Comparator:	
Switching rate	1 kHz ±3%
Signal switching modes	Selectable, internal or external

TABLE 1-1 (Cont)

External switching signal	1 kHz square-wave output signal; level, 0 to 75 volts continuously adjustable; phase 0 or 180 degrees selectable by front panel control
Recorder Output:	
Range	0 to 1mA into 1500 ohms ground return
Null recorder output	
Sensitivity switch low position	2 volts across 1000 ohms with 3dB nominal deviation from null
Sensitivity switch high position	2 volts across 1000 ohms with 0.3dB nominal deviation from null
Noise Generator	
Amplitude	Adjustable by front panel control
Stability	±0.2dB maximum over a period of 30 minutes at a signal level to the mixer of -110dBm
Signal Input Requirements	Unmodulated cw 1 kHz synchronized square wave modulated 30MHz signals 100 ohms impedance nominal at 30 MHz
Power Requirements	
AC voltage	105 to 125 volts or 210 or 250 volts 50 or 60 Hz, 150 watts nominal
Physical Dimensions	
Height	12-7/8 inches
Length	17-3/4 inches
Width	19-3/8 inches
Weight	55 pounds (including case)
Rack mounted panel Heignt	10-1/2 inches

1-7. AUXILIARY EQUIPMENT SUPPLIED.

1-8. In addition to the integral line power cable, a 2-foot IF cable is supplied; this cable contains a TNC male connector at one end for connection the calibrator front panel in jack and a BNC female connector at the other end for connection to the mixer output source.

1-9. Two auxiliary connectors which mate with the rear panel Klystron Power and Klystron Power Input connectors are also provided; these connectors facilitate the application of the AFC correction voltage to the Reflector of the Klystron used as the Local Oscillator.

1-10. OPTIONAL ACCESSORIES.

1-11. Table 1-2 provides a listing of optional accessories available for use with the Calibrator.

Table 1-2
Optional Accessories

Model 61A1-31	30 MHz 50 to 100 ohm Matching Network
Model 61A1-34	30 MHz 200 to 600 ohm adjustable, 100 ohm output Matching Network
Model 61A1-35	30 MHz 25 to 85 ohms adjustable, 100 ohm output Matching Network
Model 34 ( ) 1	Tuneable Detector - Mixer Mounts (waveguide)
Model 61A1 ( )	Balanced 30 MHz Crystal Mixers (coaxial)

SECTION II

OPERATION

2-1. GENERAL.

2-2. This section provides the complete functional control description, operating instructions for the Model 61A1B ATTENUATION CALIBRATOR.

2-3. PRELIMINARY INSPECTION.

2-4. This unit was tested and inspected at the factory before shipment. Immediately after unpacking the equipment visually inspect it for damage which may have occurred in transit, such as broken knobs, damaged meters, etc. If there is any evidence of damage, immediately file a claim for damage in transit with the carrier.

2-5. CONTROL PANEL DESCRIPTION. (See figure 2-1.)

2-6. FRONT PANEL. Table 2-1 provides a complete functional description of all front panel controls.

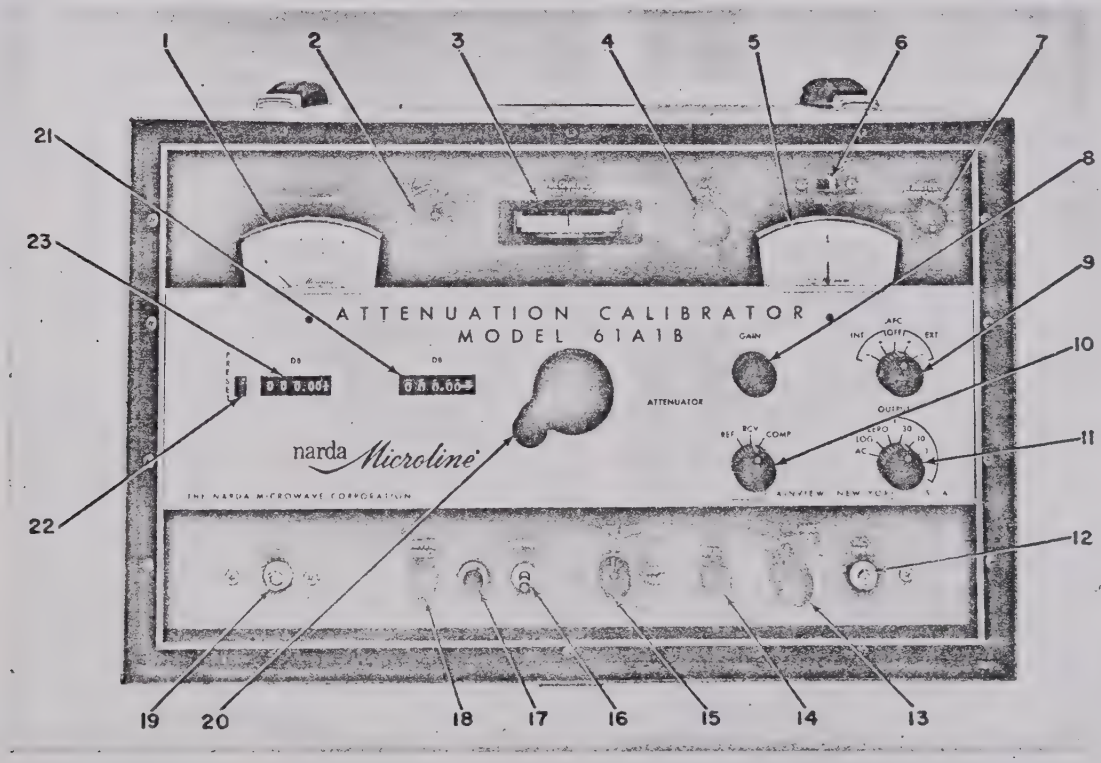


Figure 2-1. Model 61A1B ATTENUATION CALIBRATOR Front Panel Controls and Indicators

Table 2-1

Front Panel Control Functional Descriptions

Figure 2-1 Index No.	Control	Funct
1	OUTPUT meter	Indicates mixer crystal ... VTVM reading or AGC cor...
2	XTAL-OUTPUT switch	Selects polarity of cryst... (+ or -) or output functio...
3	FREQUENCY DEVIATION meter	Indicates correction voltag... corresponds to frequency ... signal. Provides zero adju... modulator in AFC amplifie...
4	AFC ZERO control	Provides zero adjustment to... tor in AFC amplifier.
5	NULL meter	Indicates null balance in com...
6	NULL meter sensitivity switch	Slide switch selects null sens... NULL meter for most conve... ment. In X10 position sensitiv... 10 times.
7	METER RESPONSE control	Permits adjustment of integra... stant in null meter circuit to r... noise fluctuations at low signa...
8	GAIN control	Adjusts gain of i-f strip in line... operation.
9	AFC switch	A five-position switch for selec... (- or +) or EXT (+ or -) AFC vol... center position (OFF), AFC is dis...
10	REF-RCV-COMP switch	Three-position switch for selecti... reference oscillator, straight rec... comparison operation.
11	OUTPUT select switch	Selects linear (1,3,10 or 30), LOG a... Zero indication on OUTPUT meter.
12	AC VIDEO jack	BNC female connector supplying a-c... output from i-f strip cathode follow...

Table 2-1

Front Panel Control Functional Descriptions

Figure 2-1 Index No.	Control	Function
1	OUTPUT meter	Indicates mixer crystal current, output VTVM reading or AGC control voltage.
2	XTAL-OUTPUT switch	Selects polarity of crystal current reading (+ or -) or output function.
3	FREQUENCY DEVIATION meter	Indicates correction voltage on AFC which corresponds to frequency deviation in input signal. Provides zero adjustment for phase modulator in AFC amplifier.
4	AFC ZERO control	Provides zero adjustment for phase modulator in AFC amplifier.
5	NULL meter	Indicates null balance in comparison mode.
6	NULL meter sensitivity switch	Slide switch selects null sensitivity for NULL meter for most convenient measurement. In X10 position sensitivity is reduced 10 times.
7	METER RESPONSE control	Permits adjustment of integration time constant in null meter circuit to reduce apparent noise fluctuations at low signal levels.
8	GAIN control	Adjusts gain of i-f strip in linear and a-c operation.
9	AFC switch	A five-position switch for selection of INT (- or +) or EXT (+ or -) AFC voltage; in center position (OFF), AFC is disabled.
10	REF-RCV-COMP switch	Three-position switch for selection of reference oscillator, straight receiver or comparison operation.
11	OUTPUT select switch	Selects linear (1,3,10 or 30), LOG AC or Zero indication on OUTPUT meter.
12	AC VIDEO jack	BNC female connector supplying a-c video output from i-f strip cathode follower.

Table 2-1 (Cont)

Figure 2-1 Index No.	Control	Function
13	NOISE BALANCE switch and control	Two position switch for inserting noise generator into reference channel and taking noise generator out of circuit (OFF). With switch set to BAL, control section permits adjustment of noise signal intensity for null.
14	NULL ZERO control	Provides electrical zero adjustment for null meter.
15	1 KC EXT MOD control	Adjust amplitude (75v) and 0° PHASE or 180° PHASE of 1 kHz external modulation square wave.
16	POWER switch	Two-position toggle switch to control application of a-c power to Calibrator.
17	POWER indicator	Indicates when a-c power is applied to Calibrator.
18	OUTPUT ZERO control	Provides electrical zero adjustment for OUTPUT meter.
19	IN jack	TNC female connector for 30 MHz input to Calibrator.
20	ATTENUATOR control	Controls attenuation setting of 30 MHz precision attenuator.
21	DB readout	Indicates relative dB setting of ATTENUATOR control
22	PRESET control	Controls setting of dB differential readout.
23	DB differential readout	Indicates attenuation of the unknown.

2-7. REAR PANEL. (See figure 2-2) Table 2-2 provides a complete functional description of all rear panel connections.

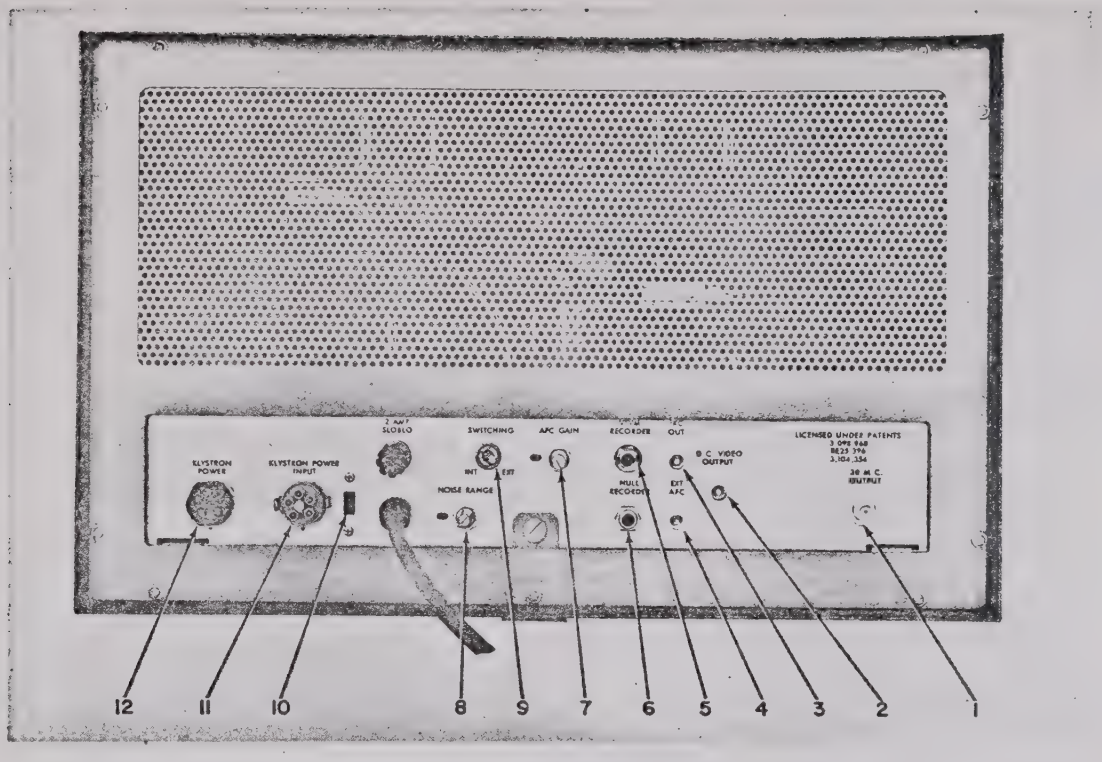


Figure 2-2. Model 61A1B ATTENUATION CALIBRATOR Rear Panel Controls and Indicators

Table 2-2

Rear Panel Control Functional Descriptions

Figure 2-2 Index No.	Control	Function
1	30 MC OUTPUT jack	TNC female connector for the OUTPUT from the 30 MHz reference oscillator.
2	D.C. VIDEO OUTPUT	BNC female connector video output of i-f strip video detector.
3	1 KC OUT jack	BNC female connector for 1 kHz square wave output to scope sync and external switching.
4	EXT AFC jack	BNC female connector for external AFC control signal input.

Table 2-2 (Cont)

Figure 2-2 Index No.	Control	Function
5	VTVM RECORDER jack	Output phone jack for 1 mA to 1500-ohm graphic recorder, one side ground; connected in VTVM for OUTPUT meter. Recorder current not affected by switching OUTPUT meter to XTAL function.
6	NULL RECORDER jack	Output Phone jack for output in proportion to indication on the NULL meter.
7	AFC GAIN control	Adjusts gain of AFC amplifier.
8	NOISE RANGE control	Varies range of noise generator.
9	SWITCHING/INT-EXT switch	A two position toggle switch for selection of internal or external switching mode.
10	115-230 volt power switch	Two-position switch which selects 115 volt or 230 volt power for Calibrator operation.
11	KLYSTRON POWER INPUT	Six-pin connector for associated klystron power supply input.
12	KLYSTRON POWER connector	Six-pin connector for supplying AFC corrected voltage to associated klystron.

2-8. PRE-OPERATION.

2-9. The following pre-operation procedure must be performed before operating the Model 61A1B ATTENUATION CALIBRATOR.

a. Connect the unit under test as shown in figure 2-3.

b. Set the POWER switch to the ON position.

NOTE

Allow 15 minutes warmup before operating the unit.

c. Perform the preliminary Frequency Adjustments specified in paragraphs 2-11 and 2-12.

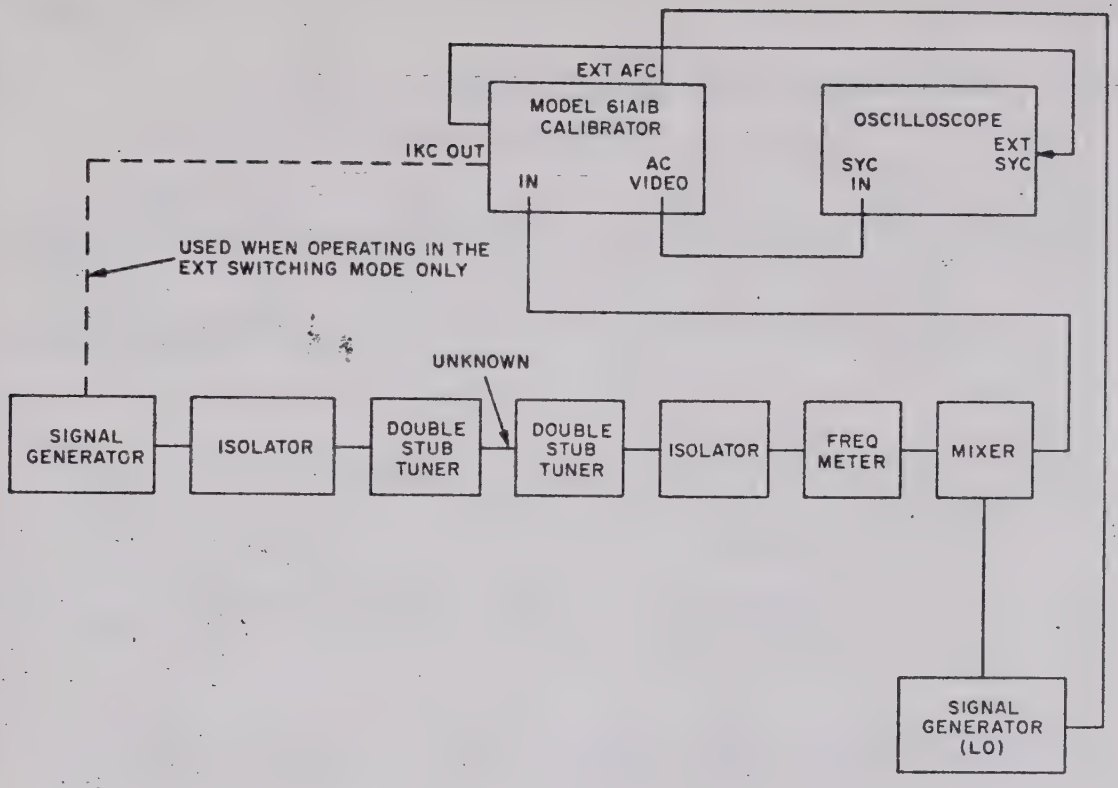


Figure 2-3. Typical Calibrator coax Setup.

2-10. FREQUENCY ADJUSTMENTS.

2-11. PRELIMINARY ADJUSTMENT. Perform the preliminary frequency adjustment as follows:

a. Set the rear panel SWITCHING switch to the INT position.

b. Set the XTAL-OUTPUT switch to the OUTPUT position.

c. Set the OUTPUT select switch to the ZERO position.

d. Set the NULL sensitivity switch to the X1 position.

e. Set the REF-RVC-COMP switch to the REF position.

f. Adjust the NULL ZERO control for a zero indication on the NULL meter.

g. Adjust the OUTPUT ZERO control for a zero indication on the OUTPUT meter.

h. Adjust the ATTENUATOR control for a reading of approximately 50dB in the DB readout window.

i. Set the AFC switch to the OFF position.

j. Adjust the AFC ZERO control for a zero indication on the FREQUENCY DEVIATION meter.

k. Set the Klystron (or signal source) frequencies and power levels.

l. Set the REF-RVC-COMP switch to the COMP position.

m. Readjust the LO signal source for a center zero indication on the FREQUENCY DEVIATION meter. The true center zero will be indicated by the rapid transverse of the meter pointer through this zero.

n. Set the AFC switch to the INT (+ or -) position (depending on whether the LO signal is above or below the signal).

NOTE

If the LO is below, the AFC will hold on INT (-) and vice-versa.

p. Set the XTAL-OUTPUT switch to the XTAL position.

q. Set the Klystron (or signal source) LO power level for a mixer current indication on the 3 scale of the OUTPUT meter equal to the recommended mixer LO power.

NOTE

Some balanced mixers will not indicate crystal current. Correct power input must be set to 1-2 mW nominal.

2-12. FINAL ADJUSTMENTS. Perform the final frequency adjustments as follows:

a. Set the XTAL-OUTPUT switch to the OUTPUT position.

b. Set the REF-RCV-COMP switch to the RCV position.

c. Set the AFC switch to the OFF position.

d. Set the OUTPUT switch to the 30 position.

e. Adjust the GAIN control to the mid scale position.

f. Apply signals from the Klystrons (or signal sources) and adjust the LO signal source for a peak indication on the OUTPUT meter.

NOTE

If Klystrons are being used, adjust the reflector voltage on the LO Klystron for a maximum indication on the OUTPUT meter.

g. Readjust the LO signal source for a center zero indication (rapid change) on the FREQUENCY DEVIATION meter.

h. If Klystrons are being used as the signal source, slowly increase and decrease the LO gnal source reflector voltage slightly. Observe that there is a rapid change in the FRE-UENCY DEVIATION meter in opposite directions.

NOTE

When making measurements below approximately -90dBm, noise is present in the AFC system. It is therefore necessary to set the Klystron frequency as close as possible to zero indication on the FREQUENCY DEVIATION meter (with AFC OFF) to minimize the effects of the AFC noise. The frequency can be adjusted at a low level, approximately -70dBm or so, and the adjustment will hold throughout the range.

i. Set the REF-RCV-COMP switch to the COMP position.

j. Repeat step g.

k. Set the AFC switch to the INT + or - position (depending on whether the LO signal is ove or below the signal).

l. Observe the FREQUENCY DEVIATION meter; it should indicate approximately zero.

NOTE

If the FREQUENCY DEVIATION meter indication oscillates; rotate the AFC GAIN potentiometer counterclockwise until the oscillation ceases.

m. Adjust the ATTENUATOR control for a zero indication on the NULL meter.

n. Readjust the signal source or LO signal source for a optimum zero indication.

13. If external switching is used, it will be necessary to adjust the signal source for oper modulation before the final frequency adjustment. It must be modulated without distrtion and be in the proper phase with respect to the Calibrator reference oscillator modution. When a Klystron is used, phase of the modulation will change 180° when reflector ltage is switched from one side of the mode to the other side of the same mode. In signal nerators, a phase reversal switch is frequently included for the modulation. Signal modulaon must be such that the signal and reference oscillator are on alternately. Modulation aveform may be observed by operating the Calibrator in the COMP mode and displaying the C output on an oscilloscope. If the oscilloscope is synchronized with the 1 kHz output from e Calibrator, phase of the signal modulation with respect to the reference is easily deterined. Once the user has become accustomed to operation of the Calibrator, it will be mediately apparent if the signal is not in proper phase; if such is the case, the front panel KC EXT MOD control may be reversed.

NOTE

Once the desired phase position of the 1 KC EXT MOD control is set, rezero the NULL meter and the attenuation reference.

If the phase position is changed during a measurement. it will be necessary to rezero the null and attenuation reference.

2-14. Final tuning on the mixer should be for the maximum 30 MHz output signal. Usually, there will be a slight difference in tuning between LO mixer current and maximum i-f signal out. If measurements are being made to low levels, it is important that i-f output from the mixer be maximized.

2-15. NOISE BALANCING ADJUSTMENT PROCEDURE. When external switching is used, the mixer noise is present in both channels. However, when internal switching is used at low power levels mixer channel noise will exceed the reference channel noise. The following adjustments introduce the internal noise generator into the reference channel as a means of balancing the two channels.

a. Set the ATTENUATOR control to greater than 120dB on the dB readout window.

b. Remove the signal and set the NOISE BALANCE switch to the BAL position.

NOTE

The RF Output from the Signal Generator must be attenuated to O output.

c. Adjust the NOISE BALANCE control for a null indication on the NULL meter.

NOTE

Inability to balance noise may be due to inadequate impedance matching of the mixer. In this case use of an appropriate matching network such as the Narda Model 61A1-31 30 MHz Matching Network or the Model 61A1-34 30 MHz Tuneable Matching Network Model 61A1-35 may be required. If matching networks are not available, varying the length and type of cable between the mixer and the Attenuator Calibrator may be required.

Variation of LO power will be instrumental in affecting a noise balance. The LO power level will affect both the noise of the mixer crystal and the operating impedance of the crystal.

SECTION III

THEORY OF OPERATION

3-1. GENERAL.

3-2. This section provides a brief functional description of the major circuits of the Calibrator based on functional block diagram, figure 3-1, and the schematic diagrams provided in Section VI. Waveform photographs of the output signal at each stage of the Calibrator are provided in figure 3-2 to aid in signal tracing and troubleshooting of the unit.

3-3. INPUT SWITCH.

3-4. The input switch is a two function switch; which modulates the 30 MHz signal from the mixer when internal switching is used, and inserts the 30 MHz reference oscillator signal from the attenuator in both the internal and external switch modes. High conductance germanium diode switching elements are controlled by applying the proper voltage polarity to the switch control line. When a positive switching voltage is applied the input signal diode is biased off, removing the mixer input signal; a compensating network is inserted to replace resistance and capacitance of the mixer. When a negative voltage is applied to the control line the compensating diode is biased off and the signal diode is turned on. In the internal switching mode the positive and negative voltages are alternate half-cycles of the 1 kHz squarewave. In the external switching mode, the external signal source is modulated and a fixed negative voltage is applied to the switching line, disabling the internal signal switching operation. The mixer crystal current dc return is connected to the XTAL-OUTPUT switch to provide a crystal current indication on the OUTPUT meter.

3-5. NOISE GENERATOR.

3-6. The noise generator provides a means of balancing the unequal noise levels that occur at low power levels with the Calibrator in the internal switching mode. Switching the noise generator into the reference signal line, will make noise available when the I.F. sees the reference oscillator through the precision attenuator.

3-7. ATTENUATOR.

3-8. The attenuator is a waveguide-below-cutoff design. Its attenuation characteristics are related precisely to its physical dimensions. The calibrator attenuator uses a precision lead-screwdrive with an in-line counter DB readout. The attenuation error is 0.05dB/10dB or less. The two principal sources of error are variations in transmission tube diameter and errors in the lead screw. Tube diameter is closely controlled in the attenuator and will contribute little to any observed error. The lead-screw errors tend to be cyclic rather than cumulative and permit overall measurement accuracy with the calibrator of 0.5dB or better over a 100dB range. The attenuator output coupling circuit is broadly tuned at 30 MHz into 50 ohms.

3-9. REFERENCE OSCILLATOR.

3-10. A crystal controlled vacuum tube oscillator supplies the 30 MHz reference signal. The oscillator output drives a triode buffer amplifier which provides the necessary output level. The Cathode bias in the amplifier is adjusted to set the reference oscillator output voltage. A reference signal equal to or greater than 0.8V RMS into 50 ohms is available at the 30 MC OUTPUT jack on the rear panel. Reference signal switching is accomplished in the reference oscillator by a high-conductance germanium diode in a manner similar to that of the input switch. Switching

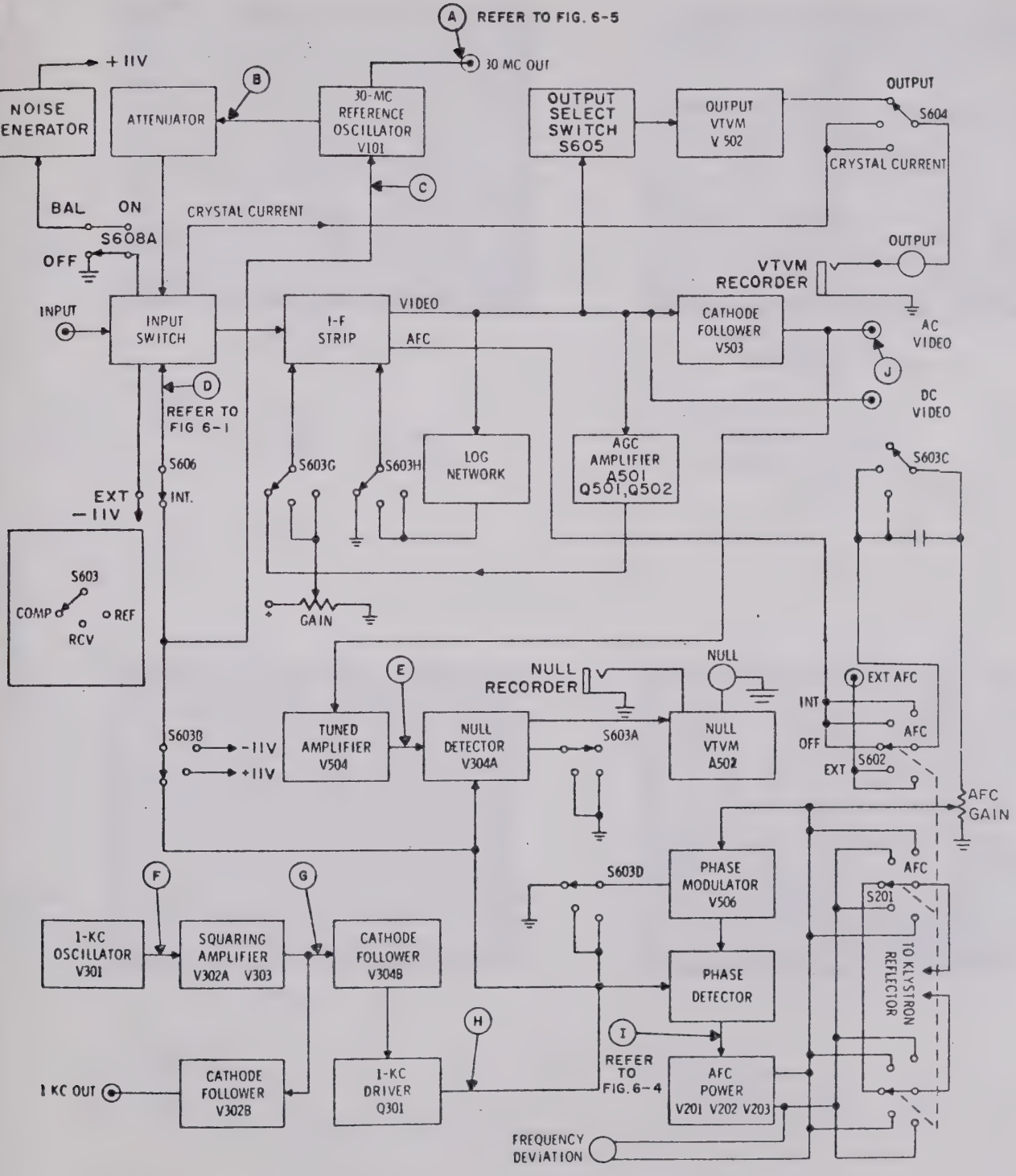


Figure 3-1. Model 61A1B ATTENUATION CALIBRATOR, Functional Block Diagram

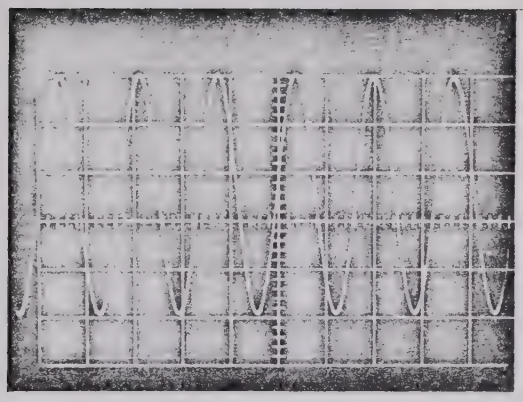


PHOTO A
WAVEFORM AT POINT A

Control Settings:
61A1B: Any Setting
Oscilloscope: 1μS/cm X5 Mag
1V/cm (X1 probe)

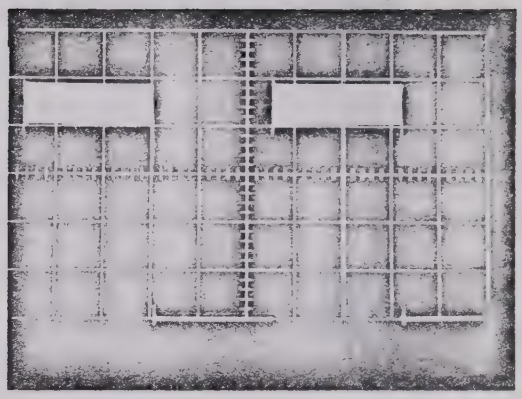


PHOTO B [1]
WAVEFORM AT POINT B

Control Settings:
61A1B: MODE: COMP
ATTEN: 50 dB
Oscilloscope: .2 m sec/cm
5 V/cm (X1 probe)

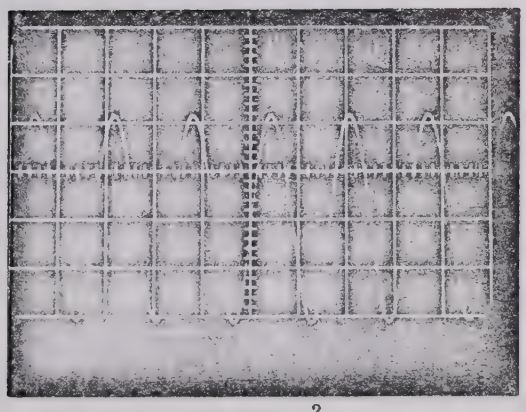


PHOTO B [2]
WAVEFORM AT POINT B

Control Settings:
61A1B: MODE: REF
ATTEN: 50 dB
Oscilloscope: .1μS/cm X5 Mag
(X1 probe)
1V/cm

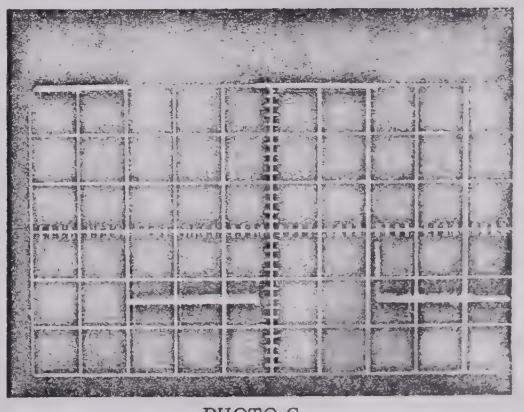


PHOTO C
WAVEFORM AT POINT C

Control Settings:
61A1B: MODE: COMP
Oscilloscope: .2 ms/cm
5V/cm (X1 probe)

NOTE:
1. All points references appear on figure 3-1.
2. Input terminated with 100 Ω load.

Figure 3-2. Model 61A1B ATTENUATION CALIBRATOR Waveforms (Sheet 1 of 5)

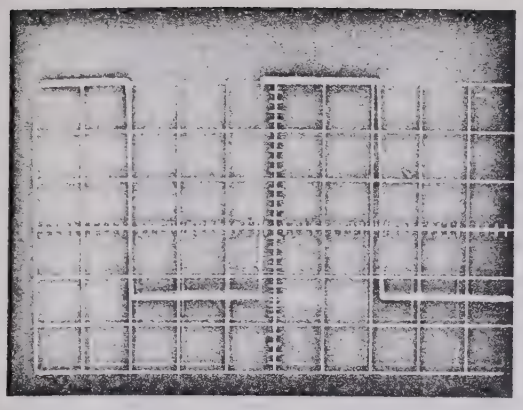


PHOTO D [1]
WAVEFORM AT POINT D [1]

Control Settings:
61A1B: MODE: COMP
SWITCHING: INT
Oscilloscope: .2 ms/cm
5 V/cm (X1 probe)

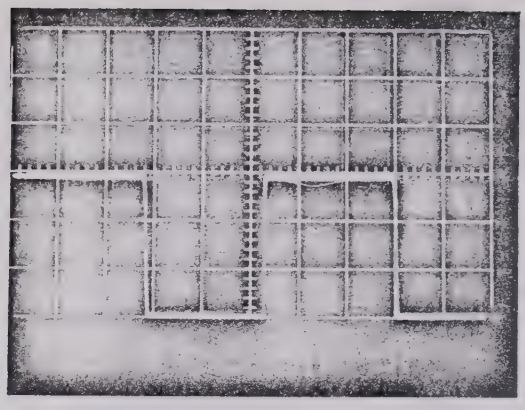


PHOTO D [2]
WAVEFORM AT POINT D [2]

Control Settings:
61A1B: MODE: COMP
SWITCHING: INT
Oscilloscope: .2 ms/cm
5 V/cm (X1 probe)

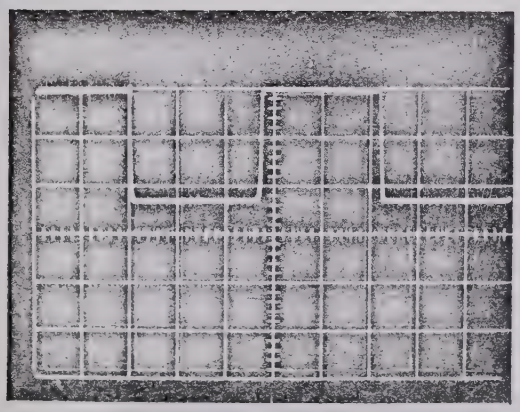


PHOTO D [3]
WAVEFORM AT POINT D [3]

Control Settings:
61A1B: MODE: COMP
SWITCHING: INT
Oscilloscope: .2 ms/cm
5 V/cm (X1 probe)

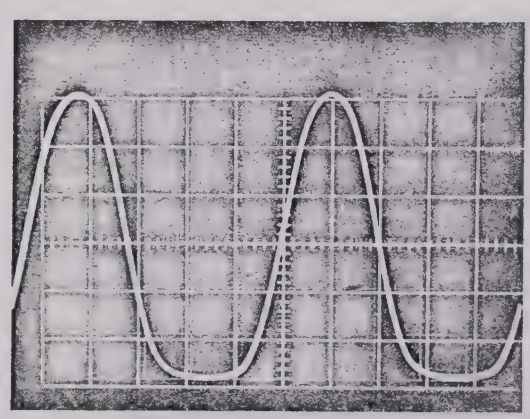


PHOTO E [1]
WAVEFORM AT POINT E

Control Settings:
61A1B: MODE: COMP
ATTEN: 87.00 dB
NULL: X1 position
C318 adjusted for 1 kHz
Oscilloscope: .2 ms/cm
20 V/cm (X1 probe)

Figure 3-2. Model 61A1B ATTENUATION CALIBRATOR Waveforms (Sheet 2 of 5)

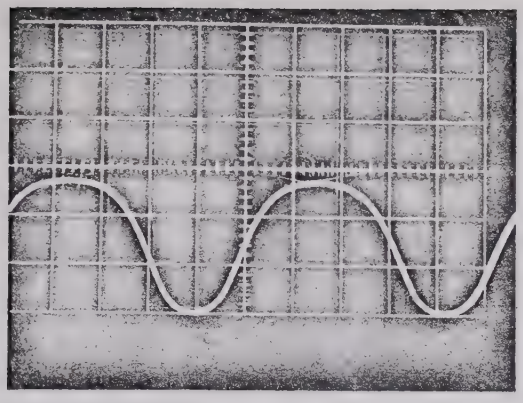


PHOTO E 2
WAVEFORM AT POINT E

Control Settings:
61A1B: MODE: COMP
ATTEN: 87.00 dB
NULL: X10 position
C318 adjusted for 1 kHz
Oscilloscope: .2 ms/cm
5 V/cm (X1 probe)

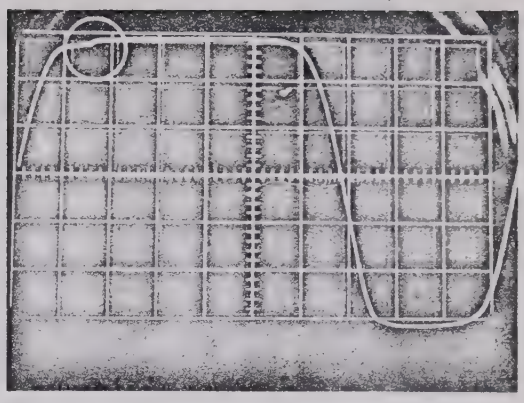


PHOTO E 3
WAVEFORM AT POINT E

Control Settings:
61A1B: MODE: COMP
ATTEN: 50.00 dB
NULL: X1 position
C318 adjusted for frequency above 1 kHz
Oscilloscope: .1 ms/cm
2 V/cm (X10 probe)

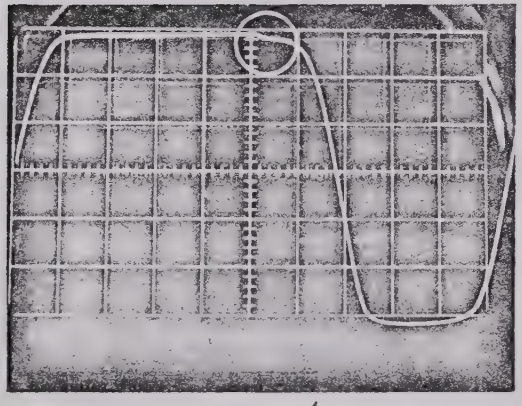


PHOTO E 4
WAVEFORM AT POINT E

Control Settings:
61A1B: MODE: COMP
ATTEN: 50.00 dB
NULL: X1 position
C318 adjusted for Frequency below 1 kHz
Oscilloscope: .1 ms/cm
2 V/cm (X10 probe)

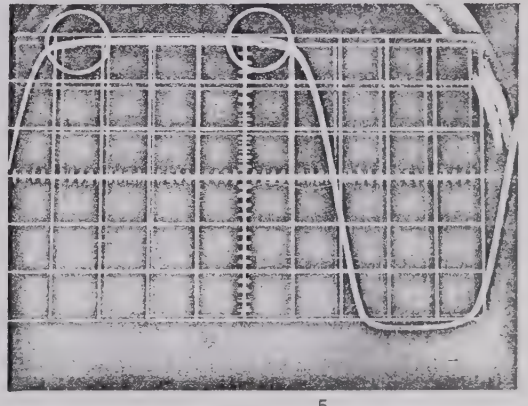


PHOTO E 5
WAVEFORM AT POINT E

Control Settings:
Same as for photo E_3 and E_4.
Superimposed photo of photos E_3 and E_4.

Figure 3-2. Model 61A1B ATTENUATION CALIBRATOR Waveforms (Sheet 3 of 5)

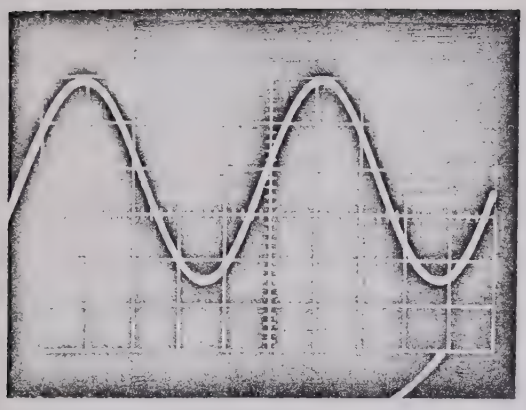


PHOTO F
WAVEFORM AT POINT F

Control Settings:
61A1B: Any Position
Oscilloscope: .2 ms/cm
2 V/cm (X1 probe)

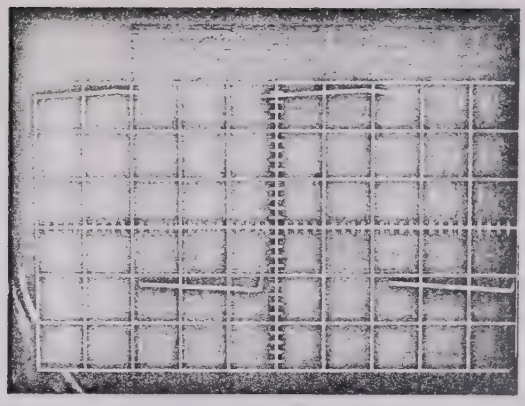


PHOTO G
WAVEFORM AT POINT G

Control Settings:
61A1B: Any Position
Oscilloscope: .2 ms/cm
20 V/cm (X1 probe)

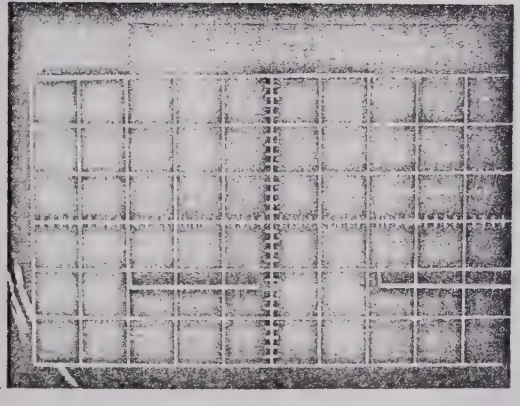


PHOTO H
WAVEFORM AT POINT H

Control Settings:
61A1B: Any Position
Oscilloscope: .2 ms/cm
5 V/cm (X1 probe)

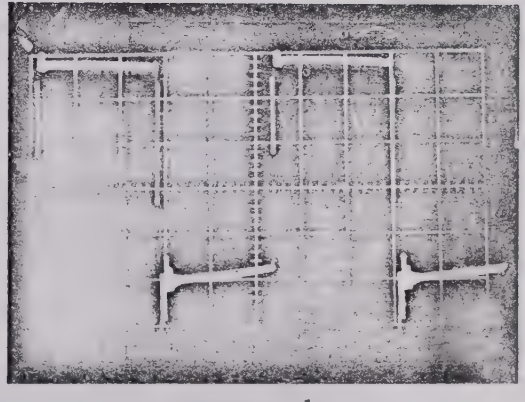


PHOTO I [1]
WAVEFORM AT POINT I[1]

Control Settings:
61A1B: MODE: RCV or REF
AFC ZERO: Full cw
Oscilloscope: .2 ms/cm
5 V/cm (X1 probe)

Figure 3-2. Model 61A1B ATTENUATION CALIBRATOR Waveforms (Sheet 4 of 5)

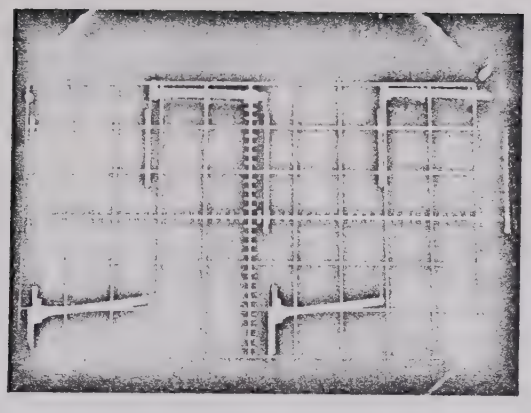


PHOTO I [2]
WAVEFORM AT POINT I[2]

Control Settings:
61A1B: MODE: RVC or REF
AFC ZERO: Full cw
Oscilloscope: .2 ms/cm
5 V/cm (X1 probe)

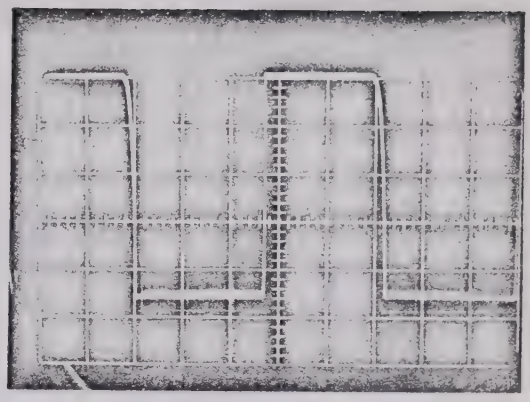


PHOTO I [3]
WAVEFORM AT POINT I[3]

Control Settings:
61A1B: MODE: RCV or REF
Oscilloscope: .2 ms/cm
1 V/cm (X1 probe)

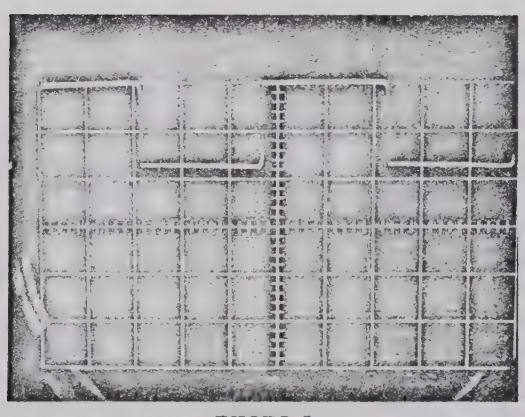


PHOTO J
WAVEFORM AT POINT J

Control Settings:
61A1B: MODE: COMP
ATTEN: 50 dB
Oscilloscope: 1 V/cm
.2/cm (X1 probe)
Time base

Figure 3-2. Model 61A1B ATTENUATION CALIBRATOR Waveforms (Sheet 5 of 5)

f the reference signal is accomplished prior to the attenuator to permit switching at a con-ant level, thereby removing any possibility of error due to switch variations with different evels. It also simplifies insertion of the reference signal when external signal switching is ised. Filament and plate voltages for the reference oscillator are regulated for stable peration.

-11. I-F STRIP.

-12. The i-f strip contains six tubes, four in the 30 MHz amplifier and two in the AFC dis-riminator. High-performance frame grid tubes are used to obtain very stable i-f character-stics. These tubes are very uniform in characteristics from one tube to the next, minimizing he readjustment required when replacing i-f strip tubes.

-13. A cascade input amplifier is used to obtain low noise figure. Two remote-cutoff pentode mplifiers permit smooth gain control with external voltages. A sharp-cutoff pentode ampli-ier drives the video detector which is a voltage doubler using two germanium diodes. The utput signal from this amplifier is also connected to a pentode limiter driving the dual-diode liscriminator.

-14. The amplifier is synchronously tuned throughout, and has a bandwidth of approximately MHz at 3dB points. The I-F strip noise figure is 2.0dB or better; however, losses in the nput switch result in an overall Calibrator noise figure of less than 3dB. AFC discriminator ensitivity is approximately 4 volts per MHz.

-15. Both cathode and grid returns for the remote cutoff stages are brought out for gain ontrol purposes.

-16. AGC AMPLIFIER.

-17. The Automatic gain control of the i-f amplifier is required to maintain constant null ensitivity over the entire operating range of the Calibrator. Any given full-scale sensitivity n dB, will have a corresponding voltage ratio at the i-f detector. However, a VTVM is used or null indication and operation is based on an absolute input voltage. It is therefore neces-ary to normalize the i-f strip output to permit a uniform dB indication on the VTVM. When he Calibrator is operated in the comparison mode, the OUTPUT meter indicates AGC voltage pplied to the i-f strip gain control line. The i-f detector output is very nearly constant over he operating range with AGC operation.

-18. The AGC amplifier consists of an integrated circuit operational amplifier, driver and urrent transistors. The current transistor is inserted in the cathode return line of the i-f mplifier remote-cutoff stages; transistor current is controlled by the operational ampli-ier and the driver. When the current transistor is conducting fully, the voltage drop across t is only a few tenths of a volt and has little biasing effect on the i-f amplifier. However, s the drive is reduced, its current capacity is reducing the gain. The AGC amplifier is ised only on comparison operation. The cathode return line is grounded for log operation nd connected to a manual gain control for other types of operation.

-19. LOG NETWORK.

-20. A logarithmic network is inserted in the AGC amplifier feedback loop to shape the bias or true logarithmic functions. Correction is adjusted for a logarithmic indication 50-dB down om full scale on the OUTPUT meter. This method lends itself to convenient indication of

bandpass response, antenna patterns, and similar applications; response is corrected to within 3 percent over the 50-dB range.

3-21. OUTPUT VTVM.

3-22. The OUTPUT VTVM consists of a conventional balanced cathode-follower circuit and is used to indicate video output, ac video output and output voltage in log response. A separate isolated power supply is used for this circuit to permit grounding one side of the OUTPUT meter circuit, facilitating use of a recorder or other output monitoring device.

3-23. CATHODE FOLLOWER (V503).

3-24. A conventional cathode follower is used to isolate the i-f amplifier output from the DC VIDEO output jack and other circuits, using the ac signal from the i-f video detector.

3-25. TUNED AMPLIFIER.

3-26. The tuned amplifier includes the standard conventional 1 kHz parallel-tuned and amplifier circuits.

3-27. NULL DETECTOR.

3-28. The null detector consists of a half-wave semiconductor detector and a split-load phase inverter which applies a push-pull null signal to the detector. Reference signal drive for the detector is obtained from the 1 kHz square wave driver. Operation of the null detector is conventional. The output signal from the detector balance potentiometer is applied to the null VTVM.

3-29. NULL VTVM.

3-30. The null VTVM utilizes an integrated circuit operational amplifier with considerable negative feedback for stable operation over extended periods. The output also provides the null recorder output.

3-31. 1 KHz OSCILLATOR.

3-32. A bridge-T r-c tuned oscillator is used for the primary 1 kHz source. Precision resistors and stable capacitors are used in the frequency determining circuit to provide long term frequency stability. The circuit is also stabilized by a thermal element, against amplitude changes. The resulting circuit is not sensitive to tube characteristics.

3-33. SQUARING AMPLIFIER.

3-34. The oscillator output signal is amplified in a single triode amplifier and clipped in a two-stage regenerative slicer. The slicer bias and amplitude are selected for minimum phase offset between the output square wave and input sine wave.

3-35. CATHODE FOLLOWER (V304B) and 1 KHz DRIVER.

3-36. The 1 kHz square wave output of the slicer is applied to the 1 kHz driver, NPN and PNP transistors through an isclating cathode follower. The cathode follower provides power gain for the transistor base circuits and drives them from full-on to cutoff. When the

Transistor is turned on, the collector current flows from the ± 11 volt power supplies through the transistor and a winding of transformer T203 to ground. When the transistors switch the half-cycle of the square wave of opposite polarity is generated to limit the voltage excursion associated with the collapse.

3-37. CATHODE FOLLOWER (V302B).

3-38. A cathode follower isolation stage is employed to couple the 1 KHz square wave to the 1 KC OUT jack. This also provides a low impedance output which is necessary to prevent deterioration of the square wave by the cables which will be attached to the 1 KC OUT jack during operation.

3-39. PHASE MODULATOR.

3-40. The AFC deck of the Calibrator is used for both comparison and single signal operation. In the comparison operating mode, the input and reference signals are alternately applied to the discriminator. If there is a frequency difference between them, the discriminator output is a square wave whose amplitude indicates the amount of difference and whose phase (with respect to the modulation) indicates whether the signal is above or below the reference. AFC operation attempts to minimize the KHz output of the discriminator and therefore locks the incoming signal to the reference frequency. This system is virtually independent of discriminator tuning.

3-41. When operating in the receiver mode, there is no switching. The discriminator output is a dc voltage whose magnitude indicates the frequency difference between the signal and center frequency tuning of the discriminator, and whose polarity indicates the direction from the center frequency (above or below).

3-42. The phase modulator operates essentially as an amplifier with the comparison signal. Tube V506 is a sheet beam containing two plates and a pair of deflection electrodes. When the deflection electrode potentials to ground are balanced, the cathode current divides evenly between the two plates. As the potentials are unbalanced the plate current balance will also shift and a difference of potential will exist between the plates. Since a transformer is used in this circuit, only changes in plate current will be evident and the initial plate current balance is not important to the proper operation. The signal grid of V506 is grounded for this mode of operation, and the tube functions essentially as a phase inverter. The 1 kHz output signal from the discriminator is applied to the deflection plate and appears as a push-pull signal on the primary of transformer T202.

3-43. In straight Calibrator operation, the push-pull signal is generated from the dc discriminator output. A 1 kHz square wave is applied to the signal grid of V506. If the two plate currents are balanced they generate square wave signals of equal amplitude on both plates. However, the net ac voltage between the plates is zero since they both received the modulated beam from the same source. If the plate currents are not balanced, the net ac voltage difference appears on the primary winding of T202. The phase of the difference voltage with respect to the grid signal depends on the way the beam was deflected. Therefore, if the tube is initially balanced, the phase at the output is determined by the potential of the signal applied to the deflection plate. V506 is balanced with no discriminator output by the front panel AFC ZERO control which adjusts the deflection plate voltage on one half of the tube. The discriminators dc output is then applied to the other deflection plate and the ac error signal is generated as in the case of the comparison operation.

3-44. Under some conditions of operation, the AFC loop gain may exceed its stable value, resulting in periodic oscillation of the front panel FREQUENCY DEVIATION meter indication. This condition, is caused mainly by klystrons which have very high tuning rates with reflector voltage variation. Adjustment of the front panel AFC GAIN control will reduce the loop gain when this condition occurs.

3-45. PHASE DETECTOR.

3-46. The phase detector operates as a full wave synchronous detector. Transformer T203 supplies the 1 KHz reference signal and transformer T202 couples the AFC signal from tube V506. Both transformers are insulated for 5000 volts working voltage to permit use with Klystrons or other devices having voltage requirements up to that value.

3-47. AFC POWER SUPPLIES.

3-48. The AFC power supply consists of two regulators supplying voltages for AFC correction. The two regulator output voltages are connected in opposition to each other; therefore, it is only necessary that they be regulated with respect to each other. Outputs are set for zero net voltage with no output from the phase detector. Voltage from the phase detector, corresponding to the signal from the AFC discriminator in the i-f strip, unbalances one of the supplies, providing a net difference between the two regulator outputs. The polarity of the difference voltage is determined by the polarity of the phase at the detector output. This arrangement permits AFC correction on devices which draw current in the correcting circuit. The high impedance of reflector circuits used with klystrons require the use of the filter consisting of R215 and C207. If a signal source is used in lieu of a klystron for the local oscillator, place a jumper between pins B and F of connector J601. This utilizes the filter circuit consisting of R215 and C207. Resistor R215 limits the AFC circuit current to a low value. Up to 20 mA current in the AFC circuit may be obtained by shorting resistor R215.

3-49. MAIN POWER SUPPLY.

3-50. The main power supply furnishes the following voltages:

a. Floating 150-volt supply for the output VTVM.

b. 6.3 volts ac unregulated for filaments.

c. Positive and negative 11 volts zener-regulated.

d. Positive 136 and 150 volts regulated.

e. 6.3 volts dc regulated for filaments.

3-51. POSITIVE 136 AND 150 VOLT REGULATED.

3-52. Drive for the gate transistor is obtained from a negative supply (which tends to turn it on) and from the positive supply through a VR tube (which tends to turn it off). The VR tube is a constant-voltage variable-current device which regulates the base drive on the transistor. The very low voltage drop of the transistor at relatively low current permits low supply voltage and low gate power dissipation. Regulator operation is straightforward. As the B+ tends to increase, base current decreases in the transistor, increasing its voltage

drop and reducing the output voltage. If the supply should short circuit, the VR tube extinguishes and the transistor will attempt to exceed its saturation current, which is limited by resistor R1 and the negative supply voltage; therefore, protecting the +136 and 150 volt supplies from damage. A prolonged short circuit on either supply line will cause the line fuse to blow. When power is first applied to the Calibrator, the +136 and +150 volt loads are low; under these conditions, it is possible to exceed the maximum voltage rating on the gate transistor. The thermistor and NE2A neon bulb provide protection to the transistor under temporary or transient conditions. With no current, the resistance of the thermistor is three to four times its operating resistance. When the transistor voltage drop reaches the firing potential of the NE2A neon bulb, it will ionize, limiting the voltage to approximately 65 volts and applying the remainder across the thermistor. After the tubes warm up the load is applied to the power supply, the voltage drops, turning off the neon bulb. The increased current heats the thermistor and reduces its resistance to the operating value. The neon bulb only operates under high voltage conditions. Output voltage from this regulator varies with the individual VR tubes, but this has no effect on the Calibrator. The +136 volt output is obtained with voltage dropping resistor R319 and the two zener regulators.

3-53. The other circuitry in the power supply consists of standard circuits.

SECTION IV

MAINTENANCE

4-1. GENERAL.

4-2. This section provides complete servicing information and instructions for performing alignment adjustment and troubleshooting of the Calibrator. Refer to figures 4-1 and 4-2 for location of internal controls.

4-3. TEST EQUIPMENT REQUIRED.

4-4. The following test equipment will be required to perform maintenance on the 61A1B ATTENUATION CALIBRATOR.

a.	Random-noise Generator	General Microwave Model 503 or equivalent
b.	Matching Network	Narda Model 61A1-31 (50Ω)
c.	Power Meter and Mount	Narda Models 443 and 471 or equivalents
d.	Oscilloscope	Tektronix 545B or equivalent
e.	Oscilloscope Plug-in	Tektronix 1A1 or equivalent
f.	Volt-Ohm-Meter	Simpson 270 or equivalent
g.	VTVM	HP 410B or equivalent
h.	60dB Fixed Attenuators	Narda Model 771 with TNC Connector or equivalent
i.	Variable I. F. Attenuator (Calibrated by NBS)	Narda Model 46B2 or equivalent
j.	VHF Oscillator	HP 3200B or equivalent
k.	Attenuation Calibrator Standard	Narda Model 61A1B or equivalent

4-5. ALIGNMENT AND ADJUSTMENTS.

4-6. When making adjustments, be certain that all preceeding adjustments have been completed in the sequence presented.

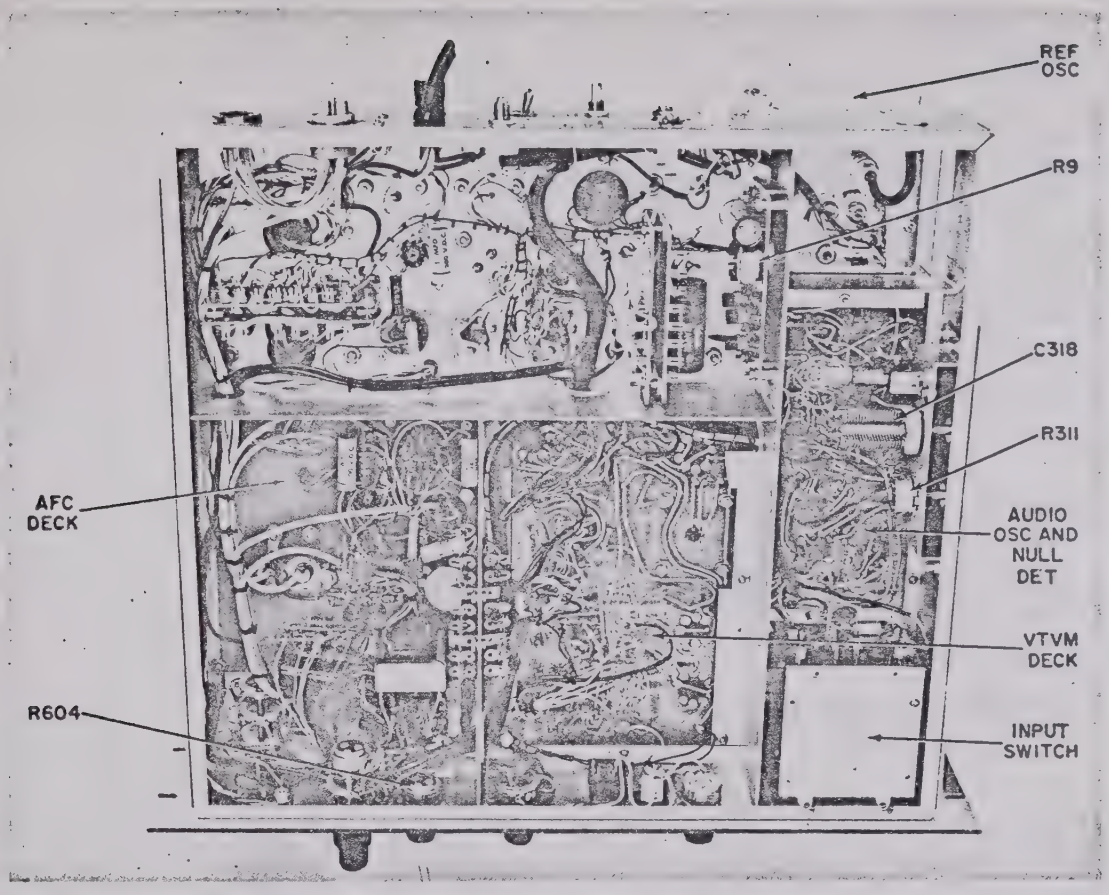


Figure 4-1. Model 61A1B ATTENUATION CALIBRATOR, Internal View (Bottom) Showing Component Locations

4-7. REGULATED FILAMENT SUPPLY ADJUSTMENT. (Refer to Figure 4-1.)

4-8. Measure the voltage from the emitter of transistor Q1 to ground using a VTVM. Adjust potentiometer R9 for an indication of -6.3 volts dc.

4-9. REFERENCE OSCILLATOR ADJUSTMENTS. (Refer to Figure 4-2.)

4-10. Perform the Reference Oscillator adjustment as follows:

a. Set the REF-RVC-COMP Switch to the REF position.

b. Set the OUTPUT Selector Switch to the 30 position.

c. Adjust the ATTENUATOR control for an indication of 60dB in the DB readout window.

d. Connect a 10dB Attenuator and a Power Meter to the rear panel 30MC OUTPUT jack.

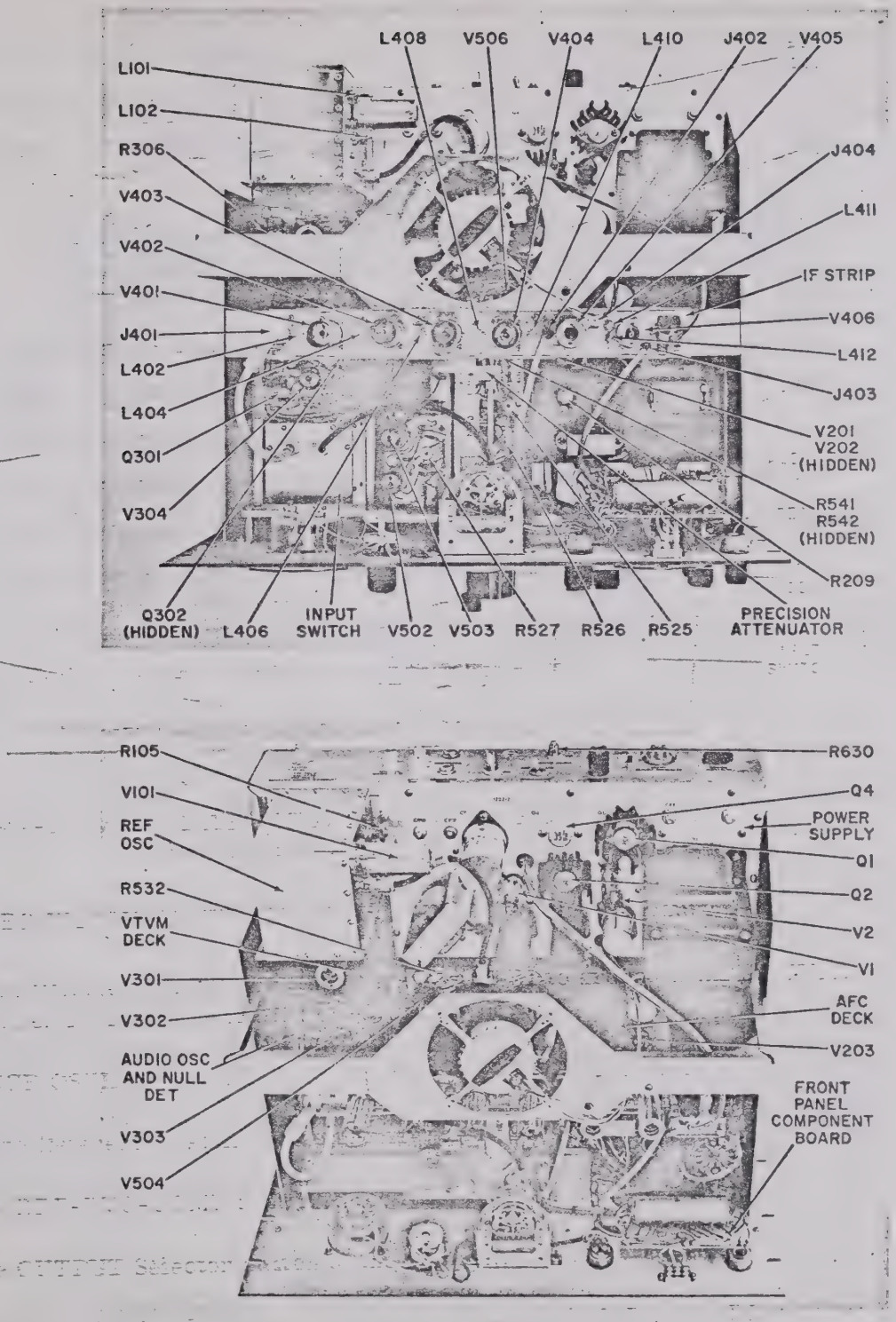


Figure 4-2. Model 61A1B ATTENUATION CALIBRATOR, Internal View (Top) Showing Component Locations

e. Adjust L101 for a maximum indication on the Power Meter; the Power meter indication should be greater than 12.8mW.

f. Adjust the GAIN control to the full clockwise position.

NOTE

If the reference source is operating and the OUTPUT meter indicates full scale, rotate the GAIN control until the OUTPUT meter indication is approximately midscale.

g. Adjust L102 for maximum deflection on the OUTPUT meter.

h. Remove the attenuator from the rear panel 30MC OUTPUT jack.

i. Adjust potentiometer R105 to its nominal mid range position.

j. Set the REF-RVC-COMP Switch to the RCV position.

k. Adjust the ZERO NULL Control for a null indication on the NULL meter.

l. Set the REF-RVC-COMP Switch to the COMP position.

m. Connect the external Variable Attenuator Input Connector to the rear panel 30 MC OUTPUT jack and the Output Connector to the Power Meter.

n. Adjust the external Variable Attenuator for a -16.5dBm reading on the Power Meter.

p. Disconnect the Power Meter and connect the unit under test as shown in figure 4-3.

q. Adjust the ATTENUATOR Control for an indication of 000.00 on the DB readout window.

r. Adjust potentiometer R105 for a null indication on the NULL Meter.

s. Repeat steps m through r.

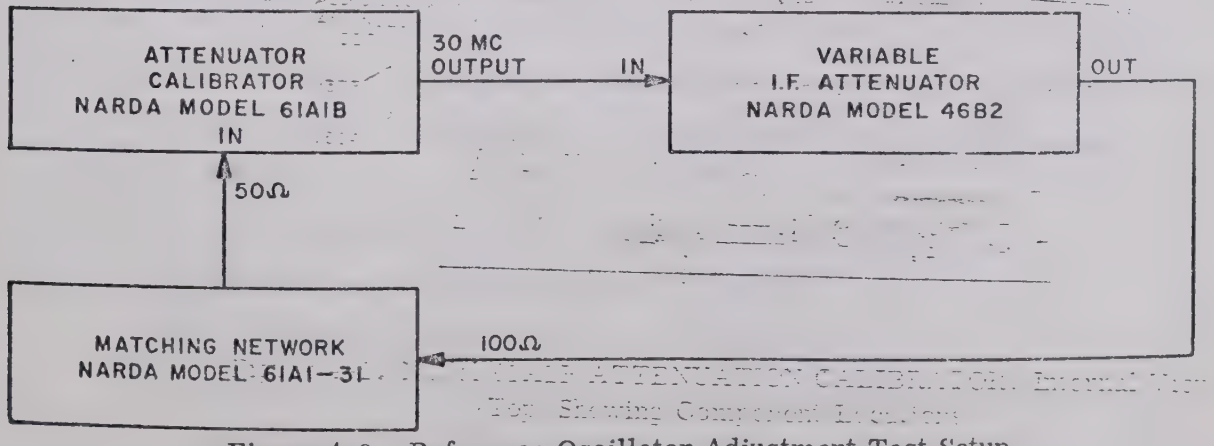


Figure 4-3. Reference Oscillator Adjustment Test Setup.

4-11. SQUARE WAVE SYMMETRY. (Refer to Figure 4-1.)

4-12. Observe the square wave at the 1 KC OUT jack and adjust potentiometer R311 for equal positive and negative periods.

4-13. 1 KHz OSCILLATOR (Refer to Figure 4-1.)

4-14. Perform the 1 KHz oscillator adjustment as follows:

a. Rotate potentiometer R311 to its mid position.

b. Measure the peak to peak voltage of the sinewave at the top of potentiometer R311.

c. Adjust potentiometer R306 for a 9.0 ±5% volt peak to peak (3.18 volts rms) indication on the VTVM.

d. Observe square wave symmetry at the 1 KC OUT jack on the oscilloscope.

e. Set the REF-RVC COMP switch to the COMP position.

f. Connect the 60dB Fixed Attenuator between the 30 MC OUTPUT jack and the IN jack.

g. Adjust the ATTENUATOR control for a clean sine wave at pin 2 of V304.

h. Adjust C318 for maximum amplitude.

NOTE

If necessary, readjust ATTENUATOR control to prevent waveform distortion.

4-15. Phase response of the tuned circuit Z501 varies with frequency, and slight frequency adjustment may be used to obtain exact phase matching between the i-f output signal and the reference signal to the phase detector. After proper adjustment, the audio oscillator frequency will be very close to the maximum response point of paragraph 4-12 step f. This adjustment is made with more convenience and precision using a dualtrace Oscilloscope. The two signals may be displayed simultaneously and matched in phase with a minimum of error.

4-16. OUTPUT VTVM CALIBRATOR. (Refer to Figure 4-2.)

4-17. Perform the output VTVM calibration as follows:

a. Set the REF-RCV-COMP switch to the REF position.

b. Set the OUTPUT select switch to the ZERO position.

c. Set the XTAL-OUTPUT switch to the OUTPUT position.

d. Adjust the OUTPUT ZERO control for a zero indication on the OUTPUT meter.

e. Adjust the ATTENUATOR Control for a 40dB indication on the DB readout indow.

f. Rotate the GAIN control to the full counterclockwise position.

g. Set the OUTPUT select switch to the 1 position.

h. Connect the VTVM to the DC VIDEO output jack.

i. Adjust the ATTENUATOR control for a -1.0 vdc indication on the VTVM.

j. Adjust potentiometer R527 for a -1 volt indication on the OUTPUT meter.

k. Set the OUTPUT select switch to the 3 position.

l. Observe the OUTPUT meter; it should indicate 1 volt on the 3 volt scale.

m. Adjust the ATTENUATOR control for a -3.0 vdc indication on the VTVM.

n. Set the OUTPUT select switch to the 10 position.

p. Observe the OUTPUT meter; it should indicate 3 volts on the 10 volt scale.

q. Adjust the ATTENUATOR control for a -10.0 vdc indication on the VTVM.

r. Set the OUTPUT select switch to the 30 position.

s. Observe the OUTPUT meter; it should indicate 10 volts on the 30 volt scale.

-18. AGC THRESHOLD ADJUSTMENT. (Refer to Figure 4-2.)

-19. Perform the AGC threshold adjustment as follows:

a. Set the REF-RCV-COMP switch to the COMP position.

b. Set the XTAL-OUTPUT switch to the OUTPUT position.

c. Adjust the ATTENUATOR control for a 0 dB indication on the DB readout indow.

d. Rotate potentiometer R526 clockwise for a -1.0 dc volt indication on the VTVM.

e. Adjust the ATTENUATOR control for a 75dB indication on the DB readout indow. Observe the indication on the VTVM, it should remain -1.0 volt nominal.

-20. AFC POWER SUPPLY ZERO ADJUSTMENT. (Refer to Figure 4-2.)

-21. Perform the AFC power supply zero adjustment as follows:

a. Set the AFC switch to EXT + or - position.

b. Set the REF-RCV-COMP switch to COMP position.

c. Adjust potentiometer R209 for a zero indication on the FREQUENCY DEVIA-ON meter.

4-22. I-F STRIP ALIGNMENT. (Refer to Figure 4-2.)

4-23. Perform the i-f strip alignment as follows:

NOTE

Allow 30 minute warmup before making adjustments.

a. Terminate IN jack with the Model 61A1-31 30 MHz Matching Network and the 50 Ω resistor.

b. Set the rear panel SWITCHING switch to the EXT position.

c. Set the REF-RCV-COMP switch to the RCV position.

d. Rotate the GAIN control to the full clockwise position.

e. Set the OUTPUT selector switch to the 3 position.

f. Set the XTAL-OUTPUT switch to the OUTPUT position.

g. Adjust the ATTENUATOR control for the maximum indication in the DB readout window.

h. Observe and note the noise indication on the OUTPUT meter; the noise level should be approximately 1.7 volts.

i. Set the REF-RCV-COMP switch to the REF position.

j. Adjust the ATTENUATOR for a 50dB indication in the DB readout window.

k. Adjust the GAIN control for an indication of 1.0 to 1.5 volts on the OUTPUT meter.

l. Adjust L410, L408, L406 L404 and L402 (in the sequence indicated) for a maximum indication on the OUTPUT meter.

m. Readjust the ATTENUATOR Control, if necessary, to maintain the 1.0 to 1.5 volt indication on the OUTPUT meter.

n. Repeat steps l and m.

p. Rotate the GAIN control to the full counterclockwise position.

q. Set the OUTPUT select switch to the 30 position.

r. Adjust the ATTENUATOR Control for a midscale indication on the OUTPUT meter.

s. Connect the VTVM to J404.

t. Adjust L411 for a maximum negative output indication on the VTVM.

u. Set the GAIN control to the full clockwise position.

v. Adjust the ATTENUATOR control for a 30 volt indication on the OUTPUT meter.

w. Terminate J403 with a 1-megohm resistor.

x. Set the VTVM to the 1 volt scale, offset the zero reading to midscale and connect the VTVM to J403.

y. Adjust L412 for the midscale volt indication on the VTVM.

z. Rotate the ATTENUATOR control clockwise until the voltage indicated on the OUTPUT meter is 1.5 times the signal input level noted in step h.

aa. Repeat step 1, while observing the voltage at J403.

ab. Repeat steps x and y.

ac. Rotate the ATTENUATOR control to gradually vary output signal from -30dB to noise.

ad. Observe the VTVM indication; the voltage indication should not vary more than ±150mV.

NOTE

If the VTVM indication is not correct, repeat steps t through ad.

4-24. NULL DETECTOR ZERO ADJUSTMENT. (Refer to Figures 4-1 and 4-2.)

4-25. Perform the null detector zero adjustment as follows:

a. Set the REF-RCV-COMP switch to the REF or RCV position.

b. Adjust the NULL ZERO control for a null indication on the NULL meter.

c. Set the NULL meter sensitivity switch to the X1 position.

d. Set the REF-RCV-COMP switch to the COMP position.

e. Set the AFC switch to the EXT + or - position.

f. Short the wiper arm of potentiometer R604 to ground.

g. Adjust potentiometer R525 for a zero indication on the NULL meter.

h. Remove the short from potentiometer R604.

4-26. NOISE GENERATOR. (Refer to Figure 4-2)

4-27. Perform the Noise Generator adjustment as follows:

a. Connect the unit under test as shown in figure 4-4.

b. Adjust the ATTENUATOR control for an indication of greater than 120dB, on the DB readout window.

c. Set the external Noise Generator for a 15dB Noise Figure.

d. Set the REF-RCV-COMP switch to the COMP position.

e. Set the rear panel SWITCHING switch to the INT position.

f. Set the NOISE BALANCE switch to the BAL position.

g. Rotate the NOISE BALANCE Control to the full counterclockwise position.

h. Adjust the NOISE RANGE potentiometer (R630) for a null indication on the NULL meter.

i. Set the external Noise Generator for a 5dB Noise Figure.

j. Rotate the NOISE BALANCE control clockwise for a null indication on the NULL meter.

NOTE

If the null cannot be obtained, repeat steps g and h.

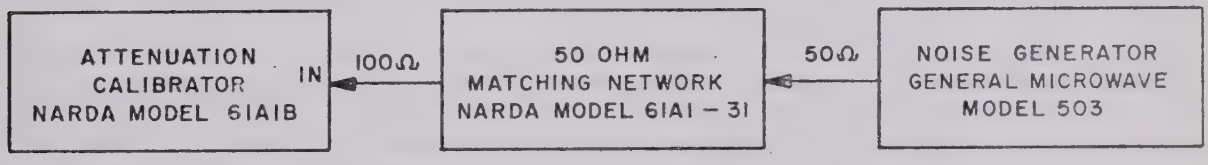


Figure 4-4. Noise Generator Test Setup.

4-28. LOG ADJUSTMENT. (Refer to Figure 4-2.)

4-29. Perform the log adjustment as follows:

a. Set the REF-RCV-COMP switch to the REF position.

b. Set the OUTPUT switch to the ZERO position.

c. Adjust the OUTPUT ZERO control for a zero indication on the OUTPUT meter.

d. Adjust the ATTENUATOR control for a 10dB indication in the DB readout window.

e. Rotate potentiometer R542 to the full counterclockwise position.

f. Set the OUTPUT selector switch to the LOG position.

g. Rotate potentiometer R541 until 10dB is indicated on the OUTPUT meter.

h. Adjust the ATTENUATOR control until 0 dB is indicated on the OUTPUT meter.

i. Press the PRESET pushbutton and adjust the ATTENUATOR control for a 50dB indication on the DB differential readout window.

j. Rotate potentiometer R542 until 50dB is indicated on the OUTPUT METER.

k. Repeat steps i through j for 10, 20, 30, 40 and 50dB, until the OUTPUT meter tracks to within 3 percent (one minor division on the OUTPUT meter dB scale).

4-30. CHECKING AC AMPLITUDE ON VTVM. (Refer to Figure 4-2.)

4-31. Check the AC amplitude on the VTVM as follows:

a. Set the OUTPUT select switch to the AC position.

b. Apply 10 volts rms, 1000 Hz to the DC VIDEO output jack.

c. Adjust potentiometer R532 for full scale indication on the OUTPUT meter.

d. Connect the VTVM to the AC VIDEO jack; it should be a minimum of 8.0 volts.

4-32. NULL DETECTOR SENSITIVITY.

4-33. Perform the null sensitivity test as follows:

a. Connect the unit under test as shown in figure 4-5.

b. Adjust the external oscillator for a 30 MHz output.

c. Set the external Oscillator Mode Switch to the CW position.

d. Set the REF-REC-COMP switch to the COMP position.

e. Set the NULL Meter Sensitivity Switch to the X1 position.

f. Set the rear panel SWITCHING switch to the INT position.

g. Adjust the ATTENUATOR control for a 30 dB indication on the DB readout window.

h. Adjust the external Variable Attenuator for a null indication on the NULL meter.

i. Press the PRESET pushbutton switch.

j. Adjust the ATTENUATOR control until a full scale deflection of the NULL meter is obtained.

k. Observe the indication on the DB differential readout window; it should be 0.20 dB or less.

l. Connect the rear panel 1KC OUT jack to the external Oscillator Pulse In jack.

m. Set the rear panel SWITCHING switch to the EXT position.

n. Adjust the ATTENUATOR Control for a 98 dB indication on the DB readout window.

p. Set the external Oscillator Mode Switch to the Pulse position.

q. Adjust the external Variable Attenuator for a null indication on the NULL meter.

r. Press the PRESET pushbutton switch.

s. Adjust the ATTENUATOR control until a full scale deflection of the NULL meter is obtained.

t. Observe the indication on the DB differential readout window; it should be 1.25 dB or less.

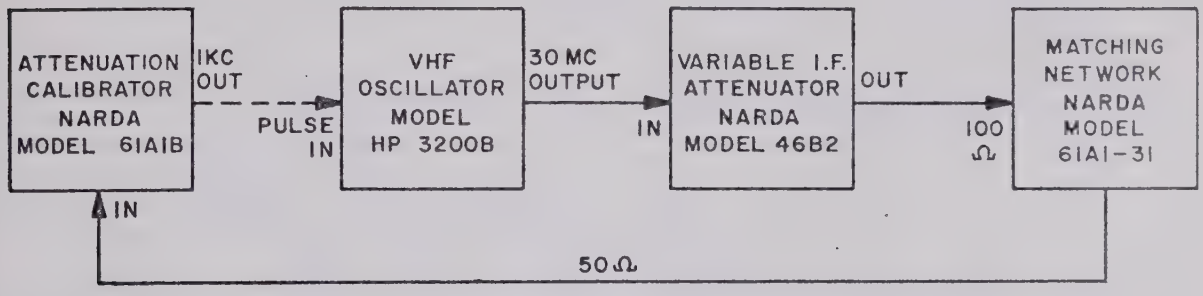


Figure 4-5. Null Detector Sensitivity Check Test Setup

4-34. ATTENUATION CHECK.

4-35. Perform the attenuation check as follows:

a. Connect the unit under test as shown in figure 4-5 with 1KC OUT connector connected as shown in broken line.

b. Adjust the 1KC EXT MOD control for the proper phase and voltage output.

c. Set the rear panel SWITCHING switch to the EXT position.

d. Adjust the external oscillator for a 30 MHz output.

e. Set the external oscillator Mode switch to the Pulse position.

f. Set the REF-REC-COMP switch to the COMP position.

g. Adjust the ATTENUATOR control for a null on the NULL meter.

h. Adjust the external Variable Attenuator to a convenient level.

i. Rotate the ATTENUATOR control for a 15 dB indication on the DB readout window.

j. Adjust the external Variable Attenuator for a null indication on the NULL meter.

k. Observe that the attenuation calibration of both the external Attenuator and the DB readout window are equal.

l. Repeat steps h through k in 10 dB steps to 70 dB.

4-36. ATTENUATOR MAINTENANCE AND ALIGNMENT. The Attenuation Calibrator incorporates a panel-mounted precision I-F attenuator, Narda Model 180091. The atten-

uator is designed and constructed to provide long life with minimum servicing. Each instrument is fully adjusted accurately calibrated and no maintenance, except for lubrication of the gear sets, should be necessary; however, should it become necessary to align the coplaner coils for maximum power transfer. proceed as follows:

a. Remove the unit from case.

b. Remove the control knobs from the trim plate of the front panel and remove the trim plate.

c. Rotate the ATTENUATOR control for a 120 dB indication on the DB readout window.

d. Disconnect all cables to the I-F strip; remove the 4 mounting screws holding the I-F strip and remove the strip.

e. Remove the Input cable to attenuator.

f. Remove electron tubes V502, V503 and V506.

g. Remove the four screws securing attenuator to front panel and withdraw attenuator assembly from the unit.

NOTE

Refer to figure 4-6 during the following disassembly procedures.

h. Remove bevel gear (1) from 1/4-inch diameter rod.

i. Remove two phillipshead screws from Bearing Block (2).

j. Remove the Bearing Block and carefully separate coupler (3).

k. Remove the three screws and washers securing Front Casting Assembly (4) to the body.

l. Connect the unit under test to the Attenuator Calibrator standard as shown in figure 4-5.

m. Adjust the external oscillator for a 30 MHz output.

n. Loosen two screws (5) securing slotted endplate of coil assembly.

p. Rotate the coil assembly for maximum output.

4-37. INSERTION LOSS CHECK. (Refer to figure 4-6.)

4-38. Perform the insertion loss check as follows:

a. Using the Attenuator Calibrator standard, and with the counter readout set at 000.00, an insertion loss of 23 ±0.5 dB is necessary in order to operate the attenuator in the linear region.

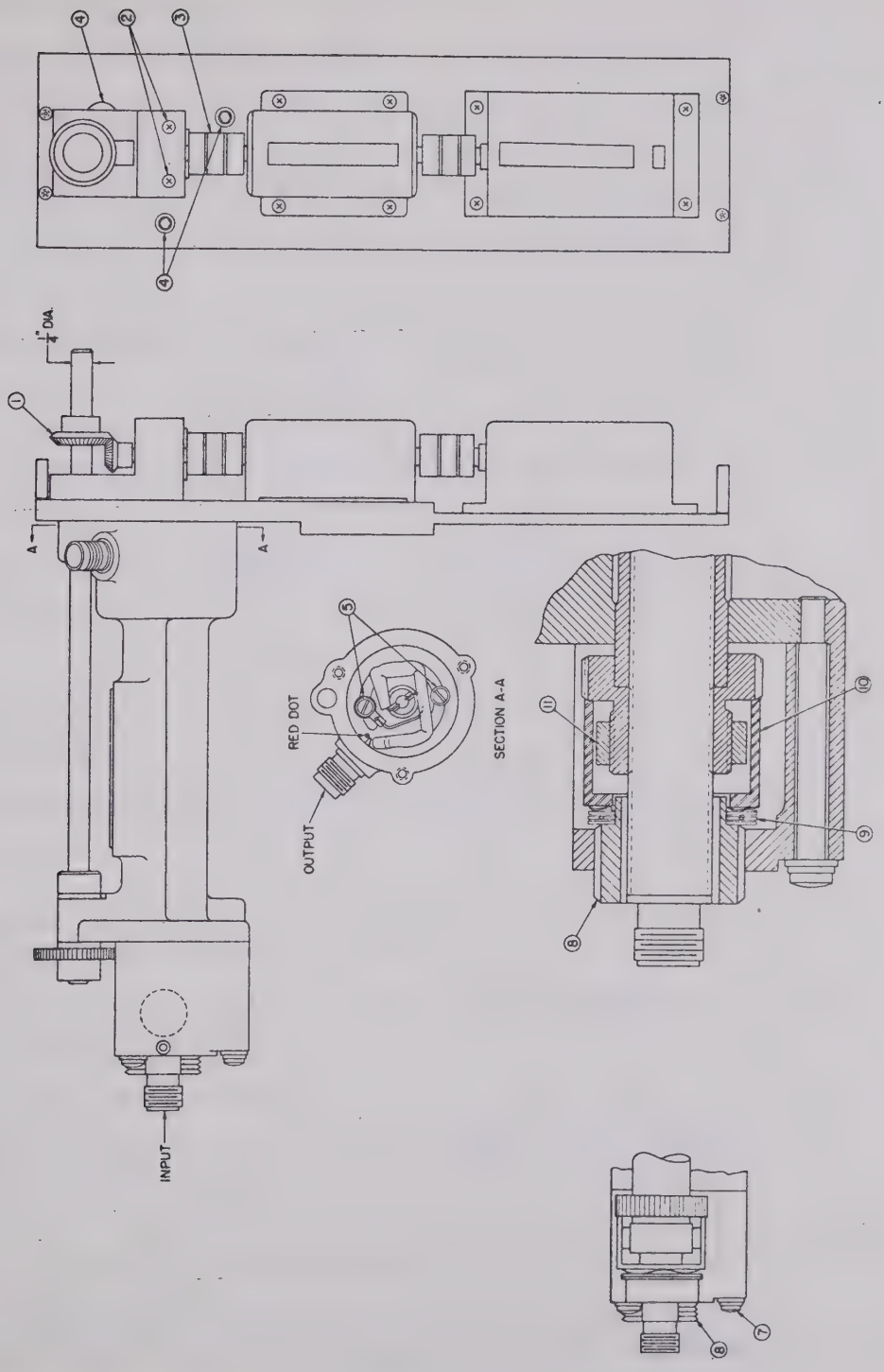


Figure 4-6. Precision I-F Attenuator, Assembly Drawing

b. If the insertion loss is other than 23 ±0.5 dB, rotate the Counters Beveled ear (6) until the correct reading is obtained.

c. Reset the counter to the 000.00 dB position.

-39. ATTENUATOR BACKLASH ADJUSTMENT.

-40. Perform the attenuation backlash adjustment as follows:

a. Set a reference level and observe the dB reading on the counter.

b. Connect the unit under test to the Attenuator Calibrator standard as shown in gure 4-5.

c. Loosen phillipshead screws (7) holding the position-threaded collar (8).

d. Remove threaded collar (8) from the drive tube.

e. Remove the four washers (9) from the backlash tube (10).

f. Tighten adjustment nut (11) on the drive tube to obtain a uniform feel with no acklash.

g. Reassemble the attenuator using the reverse of the disassembly procedure.

h. Rotate the attenuator drive shaft and reset to the dB reading observed in step a.

NOTE

If the reference level deviates, repeat steps d and g until the reference level repeats.

i. Tighten and glyptal setscrew (7) to hold the position of the threaded collar.

-41. TROUBLESHOOTING.

-42. Waveform photographs of the output signal at each stage of the Calibrator are rovided in Section III, to aid in troubleshooting the unit.

-43. Figures 3-1 and 3-2 indicate the test points used to take the photographs and all ertinent oscilloscope and Calibrator switch positions.

-44. SWITCH FUNCTIONS. (Refer to Figure 4-3.)

-45. Table 4-1 provides a complete listing of all the OUTPUT select (S605) and EF-RVC-COMP (S603) switch section functions, as an aid to maintenance of the alibrator.

-46. REPAIR AND REPLACEMENT OF COMPONENTS.

-47. When replacing components in this unit dress leads and replacement parts in the me fashion as the original part to maintain the original circuit balance and performance.

Table 4-1

Switch Functions

Switch Section	Function
OUTPUT Switch:	
S605A	Switches multiplier on OUTPUT meter. Automatically sets voltmeter sensitivity in LOG position. Switches to ac rectifier in AC position.
S605B	Grounds i-f strip grid return in all positions except LOG; grounds cathode return in LOG position.
S605C	Disconnects LOG network when not in LOG position.
REF-RCV-COMP switch:	
S603A	Grounds null meter input in RCV and REF positions.
S603B	Connects switching diodes to 1 KHz source in COMP position; activates signal switch and turns off reference switch in RCV position; turns on reference switch and biases signal switch off in REF position.
REF-RCV-COMP switch: (cont)	
S603C	In COMP position, removes short circuit across coupling capacitor and gives ac coupling in AFC signal to AFC phase modulator. In REF and RCV positions, coupling capacitor bypassed, giving dc coupling.
S603D	Grounds signal grid of AFC phase modulator in COMP position; removes ground so that 1 KHz signal is applied to signal grid in REF and RCV positions.
S603E	Increases bandwidth of dc video in COMP position.
S603F	Connects OUTPUT meter to read AGC voltage in COMP position; connects OUTPUT meter to read output voltage in REF and RCV positions.
S603G	Switches i-f strip cathode return line to AGC line in COMP position; connects cathode return line to gain control in REF and RCV positions.
S603H	Connects i-f grid bias line to ground in COMP position; connects bias line to log network in REF and RCV positions.

-48. REPLACING I-F STRIP TUBES. If it is necessary to replace i-f strip tubes, it is recommended that the tubes specified in the Replaceable Parts List, (Section VI) be used. If tubes from other manufacturers are used, it may be necessary to select the 6DJ8 tubes to obtain the specified Calibrator noise figure.

SECTION V

REPLACEABLE PARTS LIST

5-1. GENERAL.

5-2. This section provides a complete listing of the replaceable parts of this unit. The listing contains the necessary ordering information. Parts are listed in alpha-numerical order by reference designator. Complete descriptions of each component are provided in addition to the manufacturer's code and Narda part number in order to facilitate ordering of replacement parts. (See tables 5-1 and 5-2.)

5-3. ORDERING INFORMATION.

5-4. If it is desired to order replacement parts from the instrument manufacturer, address the order to:

SALES DEPARTMENT
The Narda Microwave Corporation
Plainview, New York 11803

5-5. When ordering a part in this manner, the following information should be provided:

a. Model and serial number of the instrument.

b. Narda part number.

c. Reference designation.

d. Description.

5-6. When ordering components or parts not listed in table 5-2, a complete description of the part, including its function and location should be provided with the model and serial number of the instrument.

5-7. CUSTOMER REPAIR SERVICE.

5-8. Repairs or recalibration of Narda products are performed by the Customer Service Department at the factory; however, before returning any unit, contact the Narda Microwave Corporation or the local Narda Sales Representative in your area for shipping instructions. When requesting maintenance, complete the form provided at the rear of this manual.

Table 5-1
Manufacturer's Code

Manufacturer's Supply Code	Name	Address
00656	Aerovox Corp.	New Bedford, Mass.
01121	Allen-Bradley Co.	Milwaukee, Wis.
01295	Texas Instrument, Inc. (Semi-Conductor Components)	Dallas, Texas

Table 5-1 (Cont)

Manufacturer's Supply Code	Name	Address
02111	Spectrol Electronics Corp.	City of Industry, Calif.
02660	Amphenol Corp.	Broadview, Ill.
03507	General Electric Co. (Tube Dept.)	Syracuse, N.Y.
03508	General Electric Co. (Semi-Conductor Products Dept.)	Syracuse, N.Y.
04941	Walsco Electronics Corp. (Semi-Conductor Div.)	Rockford, Ill.
07263	Fairchild Camera & Instruments Corp.	Mountain View, Calif.
07716	IRC, Inc.	Burlington, Iowa
10581	Magnetico, Inc.	East Northport, N.Y.
12697	Clarostat Mfg. Co., Inc.	Dover, N.H.
14655	Cornell-Dubilier Electric Corp. (Semi-Conductor Division)	Newark, N.J.
14936	General Instrument Corp.	Hicksville, L.I., N.Y.
15605	Cutler-Hammer, Inc.	Milwaukee, Wisc.
30684	Industrial Products Co.	Phila., Pa.
49671	Radio Corporation of America	New York, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
70903	Belden Mfg. Co.	Chicago, Ill.
71450	CTS Corp.	Elkhart, Ind.
71785	Cinch Mfg. Co. and Howard B. Jones Div.	Chicago, Ill.
72136	The Electro Motive Mfg. Co., Inc.	Willimantic, Conn.
72982	Erie Technological Products, Inc.	Erie, Pa.
73445	Amperex Electronic Corp.	Hicksville, N.Y.
74864	Amphenol Corp. - Amphenol RF Div.	Danbury, Conn.
74970	E. F. Johnson Co.	Waseca, Minn.
75042	IRC, Inc.	Phila, Pa.
75915	Littelfuse, Inc.	Des Plaines, Ill.
76487	James Miller Mfg. Co.	Malden, Mass.
76493	J.W. Miller Co.	Los Angeles, Calif.
76854	Oak Mfg. Co.	Crystal Lake, Ill.

Table 5-1 (Cont)

Manufacturer's Supply Code	Name	Address
80486	All Star Products, Inc.	Defiance, Ohio
81312	Winchester Electronics, Division of Litton Industries, Inc.	Oakville, Conn.
81349	Military Specifications, Promulgated by Standardization Division Directorate of Logistics Services DSA	
81483	International Rectifier Corp.	El Segundo, Calif.
82349	Switchcraft, Inc.	Chicago, Ill.
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.
88204	Sylvania Electric Products, Inc. Lighting Products Div.	Ipswich, Mass.
90201	Mallory Capacitor Co.	Indianapolis, Ind.
91637	Dale Electronics, Inc.	Columbus, Nebraska
91662	Elco Corp.	Willow Grove, Pa.
91802	Industrial Devices, Inc.	Edgewater, N.J.
91836	Kings Electronics Co., Inc.	Tuckahoe, N.Y.
93332	Sylvania Electric Products, Inc. Semiconductor Products Division	Woburn, Mass.
94375	Automatic Metal Products Corp.	Brooklyn, N.Y.
94990	Motorola, Inc., Government Electronics Div. Aerospace Center	Scottsdale, Arizona
95077	General R. F. Fittings, Inc.	Boston, Mass.
95712	Dage Electric Co., Inc.	Franklin, Indiana
97913	Industrial Electronics Hardware Corp.	New York, N.Y.
99120	Plastic Capacitors, Inc.	Chicago, Ill.

Table 5-2
Replaceable Parts List

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
A501	Integrated Circuit	07263	U5B770239X	84528-002
A502	Integrated Circuit	07263	U5B770939X	84533-002
C1	Capacitor: 100/100 uF, 50 vdcw	14655	TYPE BB	80143-012
C2	Capacitor: 40/40 uF, 250 vdcw	14655	TYPE BB	80143-019
C3	Capacitor: 0.22 uF, 25 vdcw	72982	5865-00Y5U224Z	80123-010
C4	Capacitor: 20/20 uF, 250 vdcw	14655	BB20/20UF250V	80143-006
C5	Capacitor: 0.1 uF, 200 vdcw	73445	C296AB/A100K	80127-010
C6	Capacitor: 20 uF, 250 vdcw	56289	1508	80120-027
C7	Capacitor: 3000 uF, 15 vdcw	99898		80151-000
C8	Capacitor: 1000 uF, 15 vdcw	14655	BR1000-15	80120-008
C9	Capacitor: 500 uF, 50 vdcw	56289	1315	80120-020
C101	Capacitor: 0.005 uF, 500 vdcw	72982	851000Z5U0502P	80128-003
C102	Capacitor: 430 pF, 500 vdcw	72136	DM15E430F0	80115-142
C103	Capacitor: 43 pF, 500 vdcw	72136	DM15E431F0	80115-120
C104	Same as C101			
C105	Same as C102			
C106	Same as C101			
C107	Same as C101			
C108	Same as C101			
C109	Not Used			
C110	Capacitor: 5 pF, 500 vdcw	72136	DM15C120J0	80115-004
C111	Same as C101			
C112	Capacitor: 1000 pF, 500 vdcw	72982	2443-000-X550-102M	80132-007
C113	Same as C112			
C114	Same as C112			
C115	Same as C101			
C116	Capacitor: 20 pF, 500 vdcw	72136	DM15C200J0500WV4CK	80115-012
C117	Same as C116			
C118	Capacitor: 24 pF, 500 vdcw	72136	DM15E240J0500WV4CK	80115-014
C119	capacitor: 5 pF, 500 vdcw	72136	DM15C06070500WV4CK	80115-005
C201	Capacitor: 30/30, 350 vdcw	14655	BB30/30 UF350V	80143-020
C202	Same as C4			
C203	Same as C5			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
C204	Capacitor: 0.01 uF, 500 vdcw	14655	BYA6S1	80128-004
C205	Capacitor: 0.01 uF, 100 vdcw	72982	845-000X5V0104Z	80123-016
C206	Same as C205			
C207	Capacitor: 1 uF, 2000 vdcw	99120	LK20-105-10	80173-000
C208	Same as C6			
C209	Capacitor: 0.001 uF, 500 vdcw	14655	BYA10D1	80128-001
C301	Capacitor: 8200 pF, 300 vdcw	81349	CM35D822JN3	80109-023
C302	Capacitor: 0.22 uF, 200 vdcw	73445	C296AB/A220K	80127-012
C303	Capacitor: 25 uF, 25 vdcw	56289	30D256G025DB0	80121-026
C304	Same as C204			
C305	Capacitor: 0.47 uF, 200 vdcw	73445	C296AB/A470K	80127-014
C306	Same as C204			
C307	Capacitor: 0.1 uf, 500 vdcw	72982	3877000Z5U0104Z	80128-007
C308	Capacitor: 10 pF, 500 vdcw	72136	DM15C120J0	80115-008
C309	Same as C307			
C310	Capacitor: 1.0 uf, 200 vdcw	56289	155P10502	80153-000
C311	Same as C303			
C312	Same as C204			
C313	Same as C204			
C314	Same as C302			
C315	Same as C204			
C316	Same as C6			
C317	Capacitor: 620 pF	81349	CM20D621JN3	80108-050
C318	Capacitor; Variable: 144 pF max	80486	143G	80182-002
C319	Not used			
C320	Same as C303			
C321	Not used			
C322	Same as C101			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
C323	Not used			
C324	Same as C307			
C401	Capacitor: 7 pF, 500 vdcw	72136	DM15C070J0	80115-006
C402	Same as C101			
C403	Capacitor: 330 pF, 500 vdcw,	72136	D15C330J0	80115-039
C404	Same as C403			
C405	Same as C209			
C406	Same as C101			
C407	Same as C101			
C408	Same as C101			
C409	Same as C403			
C410	Same as C209			
C411	Same as C101			
C412	Same as C101			
C413	Same as C403			
C414	Same as C101			
C415	Same as C101			
C416	Same as C101			
C417	Same as C403			
C418	Same as C101			
C419	Capacitor: 120 pF, 500 vdcw, ±5%	72136	DM15E121J0	80115-029
C420	Capacitor: 47 pF, 500 vdcw, ±5%	81349	CM15C470JN3	80111-015
C421	Same as C101			
C422	Same as C101			
C423	Capacitor: 22 pF, 300 vdcw	81349	CM15C220JN3	80111-007
C424	Same as C423			
C425	Same as C209			
C426	Same as C209			
C427	Same as C101			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
C428	Same as C101			
C429	Same as C101			
C430	Same as C101			
C431	Same as C101			
C432	Same as C101			
C433	Same as C101			
C434	Same as C101			
C435	Same as C101			
C436	Same as C101			
C437	Same as C101			
C438	Same as C101			
C439	Same as C101			
C440	Same as C101			
C501	Same as C5			
C502	Capacitor: 1.0 uF, 25 wdcw	56289	5C13	80139-105
C503	Same as C204			
C504	Not used			
C505	Not used			
C506	Not used			
C507	Not used			
C508	Same as C205			
C509	Same as C5			
C510	Same as C6			
C511	Not used			
C512	Not used			
C513	Not used			
C514	Capacitor: 25 uF, 25 wdcw	56289	1205	80120-011
C515	Capacitor: 100 uF, 15 wdcw	56289	30DC107G015DC2	80121-050
C516	Capacitor: 25 uF, 15 wdcw	56289	30D256G015BB2	80121-051
C517	Same as C101			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
C518	Capacitor: 0.1 uF, 12 vdcw	72982	5655-000Y5F104M	80123-002
C519	Same as C518			
C520	Same as C502			
C521	Same as C101			
C522	Capacitor: 200 pF, 500 vdcw	72136	DM15E201F0	80115-134
C523	Capacitor: 0.1 uF, 25 vdcw	72982	5815-000Y5U104Z	80123-009
C601	Same as C204			
C602	Capacitor: 10,000 uF, 3 vdcw	56289	39D109G003HS4	80172-000
C603	Same as C307			
C701	Same as C101			
C702	Same as C112			
C703	Same as C112			
C704	Same as C112			
C705	Same as C523			
C706	Same as C112			
C707	Same as C112			
C708	Capacitor: 33 pF, 500 vdcw	72136	DM15E330J0	80115-017
C709	Same as C112			
C710	Same as C516			
C711	Same as C523			
C712	Capacitor: 110 pF, 500 vdcw	72136	DM15E111F0	80115-128
C713	Same as C112			
CR1	Rectifier	81483	CER-71	80522-006
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	Same as CR1			
CR6	Same as CR1			
CR7	Same as CR1			
CR8	Same as CR1			
CR9	Rectifier	94990	1N3208	84529-001
CR10	Same as CR9			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
CR11	Same as CR1			
CR12	Same as CR1			
CR13	Same as CR1			
CR14	Same as CR1			
CR15	Same as CR1			
CR16	Same as CR1			
CR17	Diode, Zener	81483	1N2975RA	84542-000
CR18	Diode, Zener	81483	1N2975A	84542-001
CR19	Same as CR1			
CR21	Diode GN 5961-00-103-1566	04713	1N4760A	84547-000
CR22	Same as CR21			
CR101	Diode	14936	1N270	84512-006
CR102	Same as CR101			
CR201	Same as CR1			
CR202	Same as CR1			
CR203	Same as CR1			
CR204	Same as CR1			
CR205	Same as CR1			
CR206	Same as CR1			
CR301	Diode	93332	1N67A	84530-001
CR302	Same as CR301			
CR303	Not used			
CR304	Same as CR1			
CR305	Same as CR1			
CR306	Same as CR1			
CR307	Same as CR1			
CR401	Diode	93332	1N914	84505-000
CR402	Same as CR401			
CR501	Same as CR301			
CR601	Same as CR1			
CR602	Same as CR1			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
CR701	Same as CR101			
CR702	Same as CR101			
CR703	Diode, Zenner	94990	1N754A	84513-009
DS1	Lamp, Pilot	88204	NE2A	82017-003
F601	Fuse, 3AG, Slo blo	75915	31302.5	81002-024
I601	Lamp, Red (NE2H)	91802	1040A94	82015-001
J401	Connector, BNC (UG1094/U)	91836	KC-79-35	81524-000
J402	Connector, PhonoJack	95712	A-01754-1	81531-001
J403	Same as J402			
J404	Connector, Test Jack	74970	105-801	81537-001
J601	Connector, Mineature	81312	PM6S-LRN-HV-TYPE 34 GRAY	81535-001
J602	Connector, Receptacle	95077	4068-0004	81543-005
J603	Cable Assembly	99899	220571	220571
J604	Connector, BNC (UG625/U)	30684	5575	81534-000
J605	Connector, Phone Jack	82349	12A	81519-000
J606	Same as J603			
J607	Same as J604			
J608	Same as J604			
J609	Same as J605			
L1	Choke: 2.5 hy			80510-000
L101	Coil, Variable 5950-00-586-6942	76493	4501	84603-001
L102	Coil, Variable 5950-00-973-1134	76493	4502	84603-005
L103	Not used			
L104	Coil: 15 uh	76493	1537-722	84602-027
L105	Same as L104			
L106	Same as L104			
L107	Coil, RF: 1.5 uh	76493	1537-710	84602-015
L108	Same as L107			
L109	Same as L104			
L110	Same as L104			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
L111	Same as L104			
L112	Same as L107			
L113	Coil, RF: 0.15 uH	76493	9240-701	84602-003
L401	Coil, RF: 22 uH	76493	1537-724	84602-029
L402	Coil, Variable	76493	41A156CB1	84603-002
L403	Same as L104			
L404	Same as L102			
L405	Same as L104			
L406	Same as L102			
L407	Same as L107			
L408	Same as L102			
L409	Same as L107			
L410	Same as L102			
L411	Same as L102			
L412	Coil, Variable	76493	4503	84603-006
L413	Same as L107			
L414	Same as L107			
L415	Same as L107			
L416	Same as L107			
L417	Same as L107			
L418	Same as L107			
L701	Same as L104			
L702	Same as L104			
L703	Not used			
L704	Same as L104			
L705	Same as L104			
L706	Same as L104			
L707	Coil, RF: 0.68 uH	76493	1537-706	84602-011
L708	Coil, RF: 2.7 uH	76493	1537-713	84602-018
L709	Coil, RF: 220 uH	76493	1537-736	84602-041
M601	Meter			82510-000
M602	Meter			82509-000

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
M603	Meter			82508-000
P401	Connector, Plug	71785	261-11-06-010-P-306-AB	81536-009
P601	Connector, Power Cord	70903	17406	89603-002
P602	Connector, Miniature	81312	PM6P-LRN-HV-TYPE 34 GRAY	81535-002
P603	Connector, Socket and Plug	71785	261-12-06-030-S-306-CCT	81536-004
Q1	Transistor	93332	2N176	89015-000
Q2	Same as Q1			
Q3	Transistor	49671	2N1184	89020-016
Q4	Transistor	49671	2N1365	89020-017
Q5	Transistor	03508	2N508A	89020-013
Q6	Same as Q5			
Q7	Same as Q5			
Q301	Transistor	01295	2N697	89020-010
Q302	Transistor	01295	2N1305	89020-004
Q501	Transistor	49671	2N398A	89020-007
Q502	Same as Q301			
Q701	Transistor	49671	2N964	89020-015
R1	Resistor, Fixed, Wire Wound 68 ohms, 5W, ±5%	81349	RW57G330J	83042-069
R2	Resistor, Fixed, Composition: 1K, 1W, ±5%	81349	RC32GF102J	83014-049
R3	Same as R1			
R4	Resistor, Fixed, Composition: 2.2K, 1/2W, ±5%	81349	RC20GF222J	83010-057
R5	Resistor, Fixed, Wire Wound 0.56 ohms, 2W, ±5%	75042	BWH-0.56 OHMS	83034-010
R6	Same as R5			
R7	Resistor, Fixed, Composition: 100K, 1/2W, ±5%	81349	RC20GF104J	83010-097

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R8	Resistor, Fixed, Composition: 240 ohms, 1/2W, ±5%	81349	RC20GF241J	83010-034
R9	Resistor, Variable, 60 ohms, 1/2W, ±20%	71450	110-60F	83035-007
R10	Not used			
R11	Resistor, Fixed, Composition: 100 ohms, 1/2W, ±5%	81349	RC20GF101J	83010-025
R12	Resistor, Fixed, Wire Wound: 2K, 5W, ±5%	81349	RW57G202J	83042-104
R13	Resistor, Fixed, Wire Wound: 1K, 5W, ±5%	81349	RW57G102J	83042-097
R14	Thermistor, 250 ohms cold, 50 ohms hot @ 150 ma	04941	1717	83079-001
R15	Not used			
R16	Not used			
R17	Resistor, Fixed, Wire Wound 10 ohms, 2W, ±5%	75042	BWH-10 OHMS	83034-040
R18	Same as R17			
R19	Resistor, Fixed, Composition: 330 ohms, 2W, ±5%	01121	RC42GF331J	83011-037
R20	Resistor, Fixed Composition: 10K, 2W, ±5%	75042	BWH-10 OHMS	83034-089
R101	Resistor, Fixed, Composition: 47K, 1/2W, ±5%	81349	RC20GF473J	83010-089
R102	Resistor, Fixed, Composition: 220 ohms, 1/2W, ±5%	81349	RC20GF221J	83010-033
R103	Resistor, Fixed, Composition: 2.2K, 1W, ±5%	81349	RC32GF222J	83014-057
R104	Same as R7			
R105	Resistor, Variable: 5K, 2W, ±5%	01121	JA2G044S502UA	83056-111
R106	Resistor, Fixed, Composition: 270 ohms, 1/2W, ±5%	81349	RC20GF271J	83010-035
R107	Resistor, Fixed, Composition: 51 ohms, 1/2W, ±5%	81349	RC20GF510J	83010-018
R108	Same as R103			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R109	Resistor, Fixed, Composition: 330 ohms, 1/2W, ±5%	81349	RC20GF331J	83010-037
R201	Resistor, Fixed, Composition: 1 Meg, 1/2W, ±5%	81349	RC20GF105J	83010-121
R202	Same as R201			
R203	Resistor, Fixed, Composition: 7.5K, 2W, ±5%	81349	RC42GF752J	83011-070
R204	Same as R12			
R205	Resistor, Fixed, Wire Wound: 3.3K, 5W, ±5%	81349	RW57G332J	83042-109
R206	Resistor, Fixed, Metal Film: 499 ohms, 1W, ±1%	91637	MFF-1-499 OHMS	83054-097
R207	Same as R7			
R208	Resistor, Fixed, Metal Film: 24.9K, 1W, ±1%	91637	MFF-1-24.9K	83054-266
R209	Resistor, Variable: 10K, 2W, ±10%	12697	43-10K	83052-125
R210	Same as R103			
R211	Same as R7			
R212	Same as R7			
R213	Same as R201			
R214	Resistor, Fixed, Composition: 470 ohms, 1W, ± 5%	81349	RC32GF471J	83014-041
R215	Same as R7			
R216	Same as R201			
R217	Same as R13			
R218	Resistor, Fixed, Composition: 1K, 1/2W, ±5%	81349	RC20GF102J	83010-049
R219	Resistor, Fixed, Composition: 3.9K, 1/2W, ±5%	81349	RC20GF392J	83010-063
R220	Resistor, Fixed, Composition: 15K, 1/2W, ±5%	81349	RC20GF153J	83010-077
R221	Resistor, Fixed, Composition: 24K, 1W, ±5%	81349	RC32GF243J	83014-082

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R222 THRU R249	Not used			
R250	Same as R11			
R301	Resistor, Fixed, Metal Oxide: 68.1K, 1/2W, ±1%	07716	CEB-TO-68.1K	83048-367
R302	Same as R301			
R303	Same as R201			
R304	Resistor, Fixed, Composition: 150K, 1/2W, ±5%	81349	RC20GF154J	83010-101
R305	Resistor, Fixed, Composition: 2K, 1/2W, ±5%	81349	RC20GF202J	83010-056
R306	Resistor, Variable: 1.5K, 1/2W, ±20%	71450	110-1500F4	83035-018
R307	Same as R201			
R308	Same as R109			
R309	Resistor, Fixed, Composition: 5.6K, 1/2W, ±5%	81349	RC20GF562J	83010-067
R310	Lamp, Pilot	88204	3S6	82017-004
R311	Resistor, Variable: 250K, 1/2W, ±30%	12697	47-250K	83057-119
R312	Same as R4			
R313	Same as R7			
R314	Resistor, Fixed, Composition: 330K, 1/2W, ±5%	81349	RC20GF333J	83010-109
R315	Same as R201			
R316	Resistor, Variable: 50K, 2W, ±10%	01121	TYPE J-50K	83124-000
R317	Same as R201			
R318	Resistor, Fixed, Composition: 470K, 1/2W,± 5%	81349	RC20GF474J	83010-113
R319	Resistor, Fixed, Composition: 6.8K, 1W, ±5%	81349	RC20GF682J	83014-069
R320	Same as R201			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R321	Same as R201			
R322	Same as R220			
R323	Resistor, Fixed, Composition: 470 ohms, 1/2W, ±5%	81349	RC20GF471J	83010-041
R324	Resistor, Fixed, Composition: 270K, 1/2W, ±5%	81349	RC20GF274J	83010-107
R325	Resistor, Fixed, Composition: 20K, 1/2W, ±5%	81349	RC20GF203J	83010-080
R326	Resistor, Fixed, Composition: 680 ohms, 1/2W, ±5%	81349	RC20GF681J	83010-045
R327	Resistor, Fixed, Composition: 27K, 1/2W, ±5%	81349	RC20GF273J	83010-083
R328	Same as R304			
R329	Not used			
R330	Same as R304			
R331	Resistor, Fixed, Composition: 22K, 1/2W, ±5%	81349	RC20GF223J	83010-081
R332	Resistor, Fixed, Composition: 820 ohms, 1/2W, ±5%	81349	RC20GF821J	83010-047
R333	Same as R201			
R334	Resistor, Fixed, Composition: 510 ohms, 2W, ±5%	81349	RC42GF511J	83011-042
R335	Not used			
R336	Resistor, Fixed, Composition: 300 ohms, 1/2W, ±5%	81349	RC20GF301J	83010-036
R337	Not used			
R338	Same as R336			
R339	Same as R101			
R340	Same as R101			
R341	Not used			
R401	Same as R11			
R402	Same as R11			
R403	Resistor, Fixed, Composition: 4.7K, 1/2W, ±5%	81349	RC20GF472J	83010-065

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R404	Resistor, Fixed, Composition: 1.2K, 2W, ± 5%	81349	RC42GF122J	83011-051
R405	Resistor, Fixed, Composition: 150 ohms, 1/2W, ±5%	81349	RC20GF151J	83010-029
R406	Resistor, Fixed, Composition: 1.8K, 1/2W, ±5%	81349	RC20GF182J	83010-055
R407	Same as R11			
R408	Same as R405			
R409	Same as R406			
R410	Same as R7			
R411	Same as R309			
R412	Same as R403			
R413	Same as R11			
R414	Resistor, Fixed, Composition: 10K, 1/2W, ±5%	81349	RC20GF103J	83010-073
R415	Same as R414			
R416	Resistor, Fixed, Composition: 160 ohms, 1/2W, ±5%	81349	RC20GF161J	83010-030
R417	Resistor, Fixed, Composition: 100 ohms, 5W, ±5%	01121	RC32GF101J	83014-025
R418	Same as R218			
R419	Same as R7			
R420	Resistor, Fixed, Composition: 18K, 1W, ±5%	81349	RC32GF183J	83014-079
R421	Same as R218			
R422	Same as R414			
R423	Resistor, Fixed, Composition: 200K, 1/2W, ±5%	81349	RC20GF204J	83010-104
R424	Same as R423			
R425	Same as R218			
R426	Same as R414			
R427	Same as R414			
R428	Resistor, Fixed, Composition: 24 ohms, 1/2W, ±5%	81349	RC20GF240J	83010-010

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R429	Same as R428			
R430	Same as R201			
R501	Not used			
R502	Resistor, Fixed, Composition: 75 ohms, 1/2W, ±5%	81349	RC20GF750J	83010-022
R503	Resistor, Fixed, Composition: 220K, 1/2W, ±5%	81349	RC20GF224J	83010-105
R504	Same as R201			
R505	Resistor, Fixed, Composition: 68K, 1/2W, ±5%	81349	RC20GF683J	83010-093
R506	Same as R219			
R507	Same as R219			
R508	Same as R304			
R509	Resistor, Fixed, Composition: 1.5K, 1/2W, ±5%	81349	RC20GF152J	83010-053
R510	Resistor, Fixed, Composition: 240K, 1/2W, ±5%	81349	RC20GF244J	83010-106
R511	Same as R201			
R512	Resistor, Fixed, Composition: 3.3K, 1W, ±5%	81349	RC32GF332J	83014-061
R513	Same as R109			
R514	Same as R2			
R515	Same as R7			
R516	Same as R4			
R517	Same as R509			
R518	Not used			
R519	Not used			
R520	Not used			
R521	Not used			
R522	Not used			
R523	Same as R423			
R524	Resistor, Fixed, Composition: 3 Meg, 1/2W, ±5%	81349	RC20GF305J	83010-132

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R525	Resistor, Variable: 10K ohm, 1/2W, ±5%	75042	MODEL 100-10K	83067-005
R526	Same as R525			
R527	Same as R525			
R528	Same as R414			
R529	Same as R414			
R530	Same as R405			
R531	Same as R405			
R532	Resistor, Variable: 100K, 1/2W, ±20%	02111	53-1-1-104	83083-001
R533	Same as R201			
R534	Same as R324			
R535	Resistor, Fixed, Composition: 18K, 1/2W, ±5%	81349	RC20GF183J	83010-079
R536	Same as R510			
R537	Same as R218			
R538	Not used			
R539	Resistor, Fixed, Metal Oxide: 11K, 1/2W, ±1%	07716	CEB-TO-11K	83048-292
R540	Resistor, Fixed, Metal Oxide: 182K, 1/2W, ±1%	07716	CEB-TO-182K	83048-408
R541	Resistor, Variable, 200K, 1/2W, ±20%	02111	53-1-1-204	83083-002
R542	Resistor, Variable, 20K, 1/2W, ±5%	75042	MODEL 100-20K	83067-004
R543	Not used			
R544	Not used			
R545	Not used			
R546	Same as R201			
R547	Same as R414			
R548	Same as R423			
R549	Resistor, Fixed, Composition: 51K, 1/2W, ±5%	81349	RC20GF513J	83010-090

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R601	Same as R535			
R602	Resistor, Variable: 50K, 1/3W, ±20%	71450	VA45-2-50K-1/3W	83077-001
R603	Resistor, Variable: 5K, 2W, ±10%	12697	43-5K	83052-423
R604	Resistor, Variable: 250K; 1/4W, ±20%	71450	VA45-2-250K-1/4W	83126-000
R605	Resistor, Variable: 1 meg, 1/2W, ±30%	12697	47-1 MEG	83057-123
R606	Not used			
R607	Resistor, Fixed, Composition: 360K, 1/2W, ±5%	81349	RC20GF364J	83010-110
R608	Resistor, Fixed, Composition: 110 ohms, 2W, ±5%	81349	RC42GF111J	83011-026
R609	Not used			
R610	Resistor, Variable, 10K, 1/2W, ±20%	12697	47-10K	83125-000
R611	Resistor, Fixed, Carbon: 3.4 Meg, 1/2W, ±1%	75042	DCC3.4 MEG	83076-002
R612	Resistor, Fixed, Carbon: 1.07 Meg, 1/2W, ±1%	75042	DCC1.07 MEG	83076-001
R613	Resistor, Fixed, Metal Oxide: 249K, 1/2W, ±5%	07716	CEB-TO-249K	83048-421
R614	Resistor, Fixed, Metal Oxide: 90.9K, 1/2W, ±5%	07716	CEB-TO-90.9K	83048-379
R615	Resistor, Fixed, Metal Oxide: 158K, 1/2W, ±5%	07716	CEB-TO-158K	83048-402
R616	Same as R509			
R617	Same as R608			
R618	Same as R101			
R619	Resistor, Fixed, Composition: 5.1K, 1/2W, ±5%	81349	RC20GF512J	83010-066
R620	Same as R218			
R621	Not used			
R622	Resistor, Variable: 1K, 1/2W, ±5%			Part of S608

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
R623	Resistor, Fixed, Composition: 9.1K, 1/2W, ±5%	81349	RC20GF912J	83010-072
R624	Same as R218			
R625	Same as R503			
R626	Same as R423			
R627	Same as R607			
R628	Same as R607			
R629	Not used			
R630	Resistor, Variable: 5K, ±20%	12697	47-5K	83057-209
R631	Resistor, Fixed, Composition: 620 ohms, 1/2W, ±5%	81349	RC20GF621J	83010-044
R632	Resistor, Variable: 5K	12697	47-5K-LH TAPER	83115-000
R633	Resistor, Fixed, Composition: (Selected at test from 10 to 20 Meg) 1/2W, ±5%	81349	RC20GF---J	83010-
R634	Same as R423			
R635	Same as R201			
R701	Same as R323			
R702	Resistor, Fixed, Composition: 360 ohms, 1/2W, ±5%	81349	RC20GF361J	83010-038
R703	Same as R11			
R704	Not used			
R705	Resistor, Fixed, Composition: 82 ohms, 1/2W, ±5%	81349	RC20GF820J	83010-023
R706	Resistor, Fixed, Composition: 22 ohms, 1/2W, ±5%	81349	RC20GF220J	83010-009
R707	Same as R218			
S601	Switch, Toggle	15605	8373K7	83508-001
S602	Switch, Rotary	76854	TYPE H - 1-3/16 SHAFT	83522-002
S603	Switch, Rotary	76854	TYPE N - 1-3/16 SHAFT	83525-002
S604	Switch, Rotary	76854	TYPE N - 1-3/16 SHAFT	83523-001

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
S605	Switch, Rotary	76854	TYPE N - 1-3/16 SHAFT	83524-002
S606	Same as S601			
S607	Switch, Slide	82349	46206L	83510-001
S608	Switch, Rotary	71450	TROLEX 212	83534-000
S609	Switch, Slide	82349	46206LF	83509-001
T1	Transformer			84011-000
T201	Transformer			84012-000
T202	Transformer			84013-000
T203	Same as T202			
V1	Electron Tube	73445	0A2	85519-000
V2	Same as V1			
V101	Electron Tube	73445	6DJ8/ECC88	85514-000
V201	Electron Tube	03507	6BX7	85516-000
V202	Electron Tube	73445	12AX7/ECC83	85520-000
V203	Electron Tube	73445	0B2	85526-000
V301	Electron Tube	73445	6U8A	85518-000
V302	Electron Tube	73445	12AT7/ECC81	85517-000
V303	Same as V101			
V304	Same as V101			
V401	Same as V101			
V402	Electron Tube	73445	6EH7/EF183	85523-000
V403	Same as V402			
V404	Electron Tube	73445	6EJ7/EF184	85522-000
V405	Electron Tube	03507	6BH6	85527-000
V406	Electron Tube	73445	6AL5	85525-000
V501	Not used			
V502	Same as V101			
V503	Electron Tube	03507	6C4	85515-000
V504	Electron Tube	73445	6686	85511-000
V505	Not used			

Table 5-2 (Cont)

Reference Designation	Description	Mfr Code	Mfr Part No.	Narda Part No.
V506	Electron Tube	03507	6AR8	85513-000
Y101	Crystal, 30 MC			87504-000
Z501	Tuned Circuit	10581	9595C	80505-000

SECTION VI

SCHEMATIC DIAGRAMS

6-1. GENERAL.

6-2. This section provides the complete set of schematic diagrams required for maintenance of the Model 61A1B ATTENUATOR CALIBRATOR.

6-3. Refer to the Component Location Table provided with the schematics, to determine the physical location of components not mounted on printed circuit boards.

6-4. The ▽ and □ symbols are marked on the body of the capacitors.

6-5. The following schematics are included in this manual:

a. Input Switch Schematic Diagram	Figure 6-1
b. Reference Oscillator Schematic Diagram	Figure 6-2
c. I-F Strip Schematic Diagram	Figure 6-3
d. VTVM Deck Schematic Diagram	Figure 6-4
e. Audio Oscillator and Null Detector Schematic Diagram	Figure 6-5
f. AFC Deck Schematic Diagram	Figure 6-6
g. Power Supply Schematic Diagram	Figure 6-7

6-6. All resistors are shown in ohms (Ω) unless otherwise specified.

6-7. All capacitors are shown in picofarads (pF) unless otherwise specified.

6-8. All coils are shown in microhenries (uH) unless otherwise specified.

6-9. All rectifiers (CR) shown are CER71 rectifiers.

6-10. *GLOBAR resistor 50Ω at 150mA.

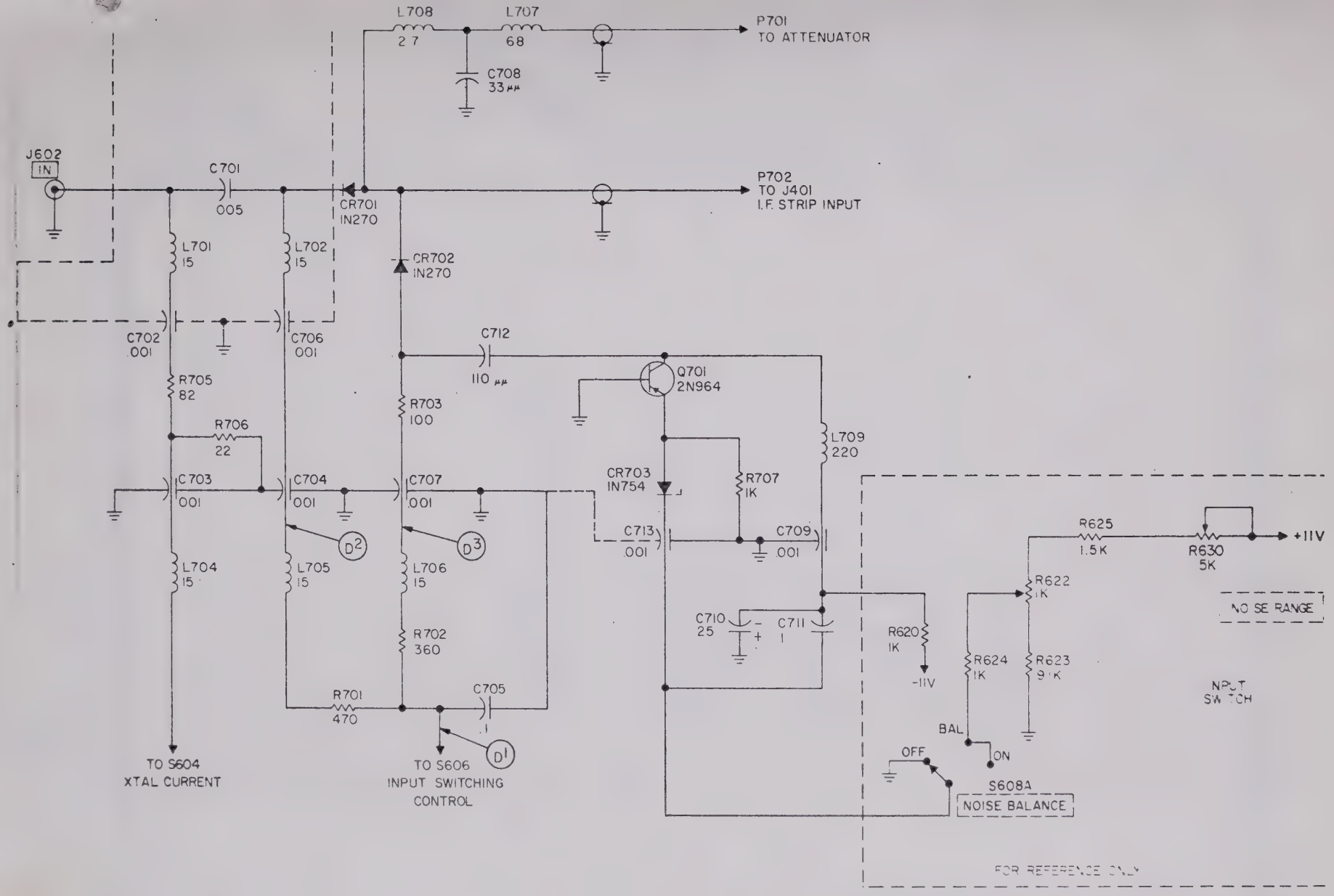


Figure 6-1. Input Switch Schematic Diagram

Input Switch
Component Locations

C701 is located between E1 and J602
C705 is located between C709 and TB701-6
C708 is located between TB703-2 and TB703-3
C710 is located between C709 and TB701-1
C711 is located between C709 and C713
C712 is located between TB703-5 and TB702-3

CR701 is located between TB703-4 Anode and E1
CR702 is located between TB703-4 Cathode and TB703-5

L701 is located between C702 and J602
L702 is located between C706 and E1
L704 is located between C703 and TB701-5
L705 is located between C704 and TB701-4
L706 is located between C707 and TB701-2
L707 is located between TB703-1 and TB703-2
L708 is located between TB703-2 and TB703-4
L709 is located between TB702-3 and L709

Q701 is located between TB702-1 (E) and TB702-2 (B) and TB702-3 (C)

R701 is located between TB701-3 and TB701-4
R702 is located between TB701-2 and TB701-3
R703 is located between TB703-5 and C707
R705 is located between C702 and C703

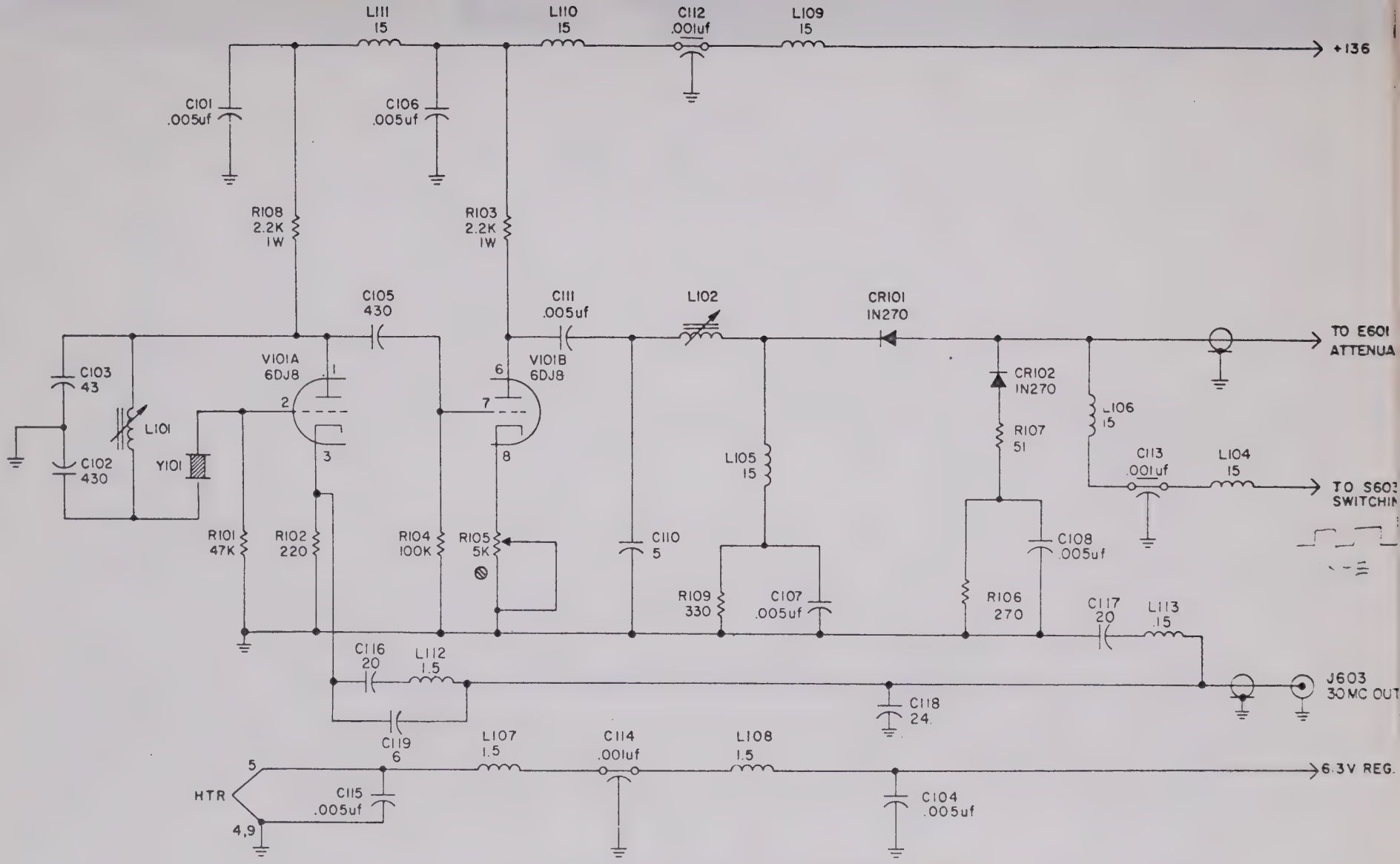
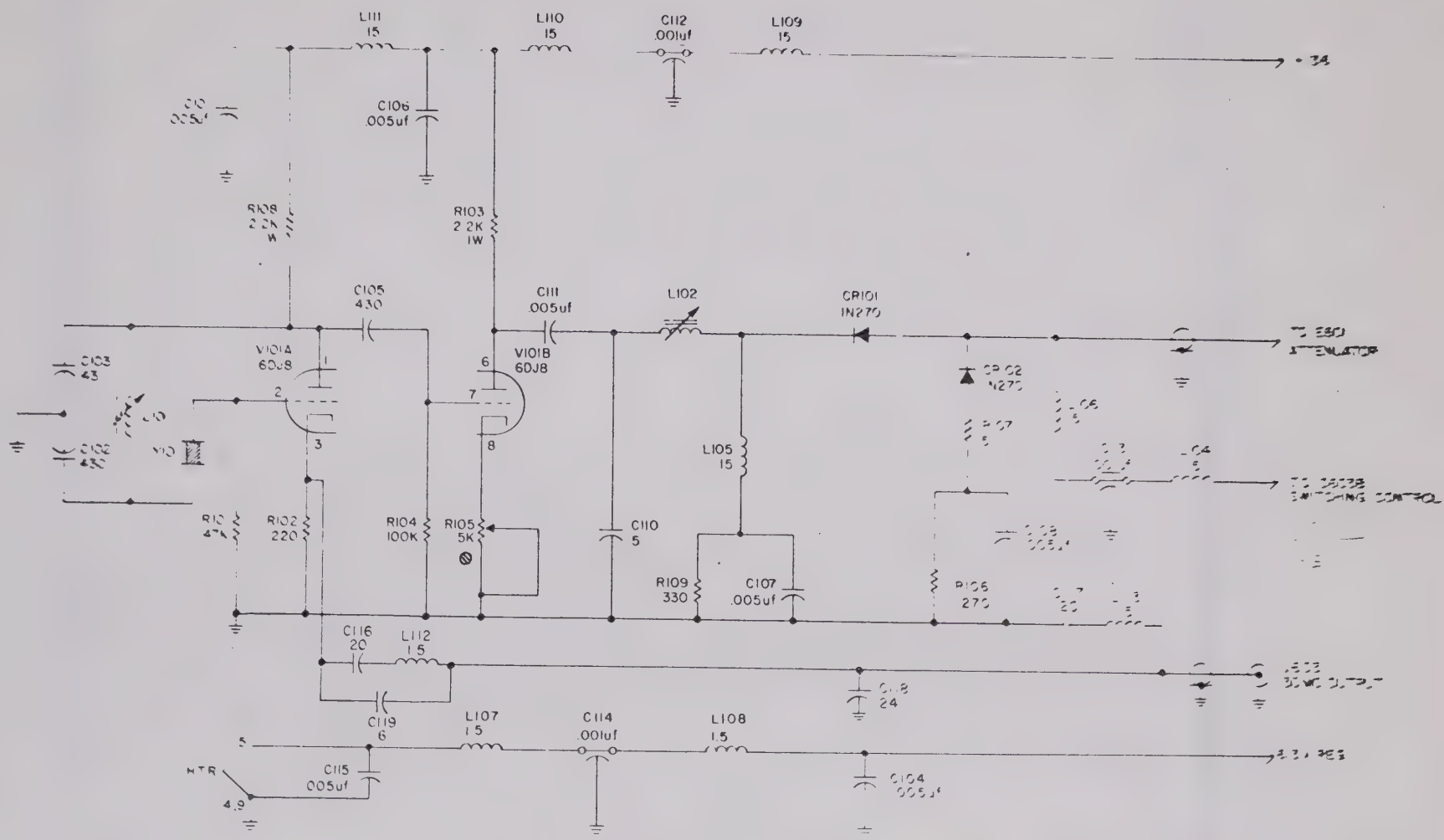


Figure 6-2. Reference Oscillator, Schematic Diagram


L111
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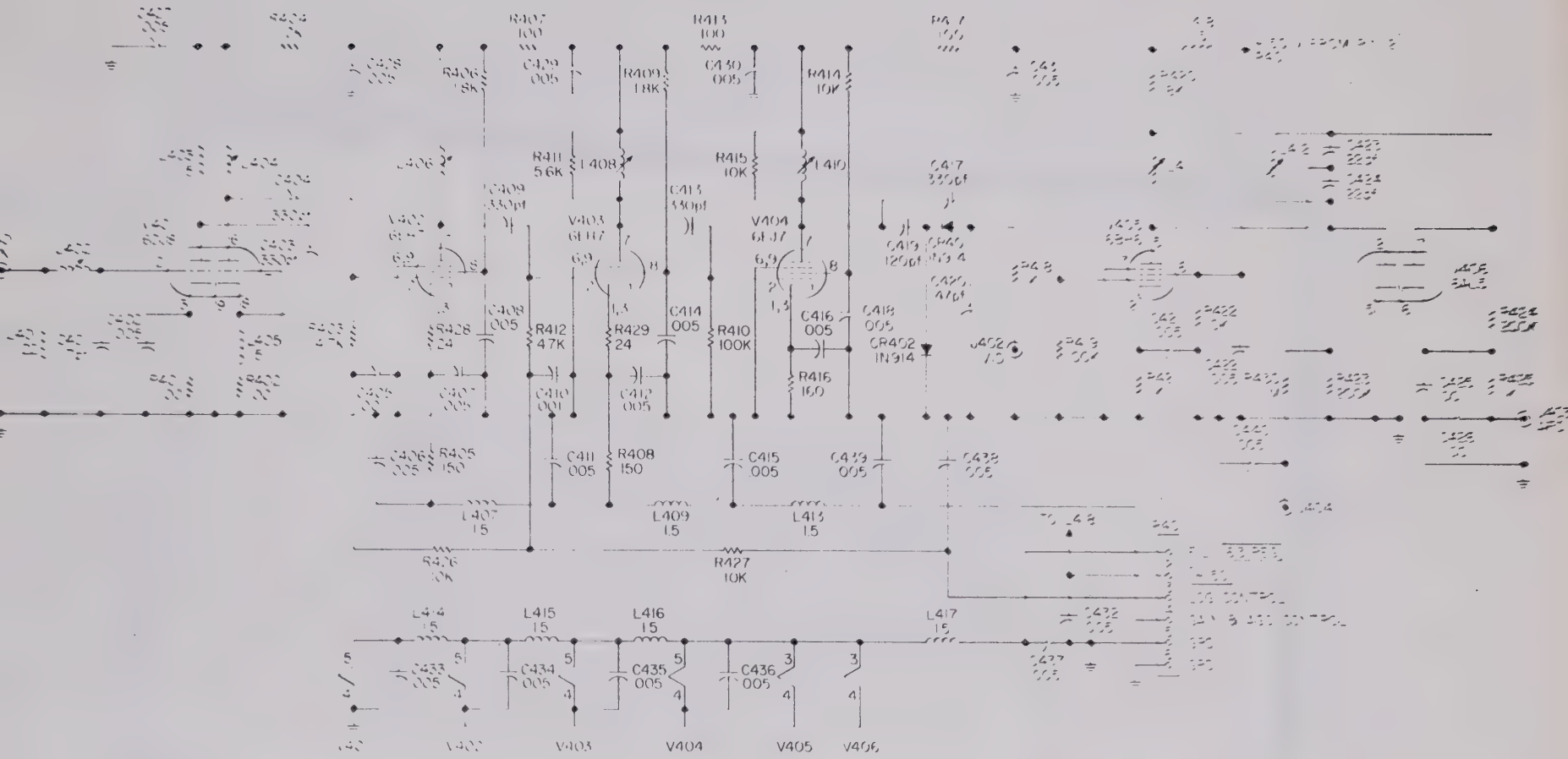
L110
15
C112
.001uf
L109
15
+34
C106
.005uf
R108
2.2K
1W
R103
2.2K
1W
C105
430
C111
.005uf
L102
CR101
1N270
V101A
6DJ8
V101B
6DJ8
C103
43
C102
43
L105
15
R101
47K
R102
220
R104
100K
R105
5K
C110
5
R109
330
C107
.005uf
R106
270
C116
20
L112
1.5
C119
6
L107
1.5
C114
.001uf
L108
1.5
C115
.005uf
C104
.005uf
HTR
4.9

Reference Oscillator
Component Locations

C101 is located between E5 GRD and E5
C102 is located between L101 Top and G4
C103 is located between L101 Bottom and G4
C104 is located between TB101-1 and TB101-3
C105 is located between V101-1 and V101-7
C106 is located between TB102 and E5 GRD
C107 is located between E1 and G4
C108 is located between E1 and G1
C110 is located between L102 Bottom and L102 GRD
C111 is located between L102 Bottom and V101-6
C113 is located between V101-4 and V101-5
C116 is located between Term. 1 and Term. 2
C117 is located between Term. 3 and Term. 4
C118 is located between Term. 3 and Term. 5
C119 is located between Term. 1 and Term. 5

CR101 is located between E3 and L102 Top
CR102 is located between E2 and E3
L104 is located between C113 and TB101-4
L105 is located between L102 Top and E4
L106 is located between E3 and C113
L107 is located between V101-5 and C114
L108 is located between C114 and TB101-1
L109 is located between C112 and TB101-2
L110 is located between E5 and C112
L111 is located between TB102 and E5
L112 is located between Term. 2 and Term. 5
L113 is located between Term. 4 and Term. 5

R101 is located between V101-2 and G2
R102 is located between V101-3 and G2
R103 is located between V101-6 and E5
R104 is located between V101-7 and G4
R105 is located between E1 and G1
R107 is located between E1 and E2
R108 is located between V101-1 and TB102
R109 is located between E4 and G4


R407 100
R413 100
C429 005
C430 005
R406 18K
R409 18K
R414 10K
R411 56K
L408
R415 10K
L410
C409 330pf
C413 330pf
C417 330pf
V403 6U17
V404 6U17
C419 1200pf
CR402 1N914
C408 005
C414 005
C416 005
C418 005
R428 24
R412 47K
R429 24
R410 100K
R416 160
C410 001
C412 005
C406 005
R405 150
C411 005
R408 150
C415 005
C433 005
C432 005
L407 1.5
L409 1.5
L413 1.5
R426 10K
R427 10K
L414 1.5
L415 1.5
L416 1.5
L417 1.5
C433 005
C434 005
C435 005
C436 005
V402
V403
V404
V405
V406

L409 is located between E6 and E8
L413 is located between P401-4 and E14
L414 is located between V401-5 and V402-5
L415 is located between V402-5 and V403-5
L416 is located between V403-5 and V404-5
L417 is located between V406-3 and P401-1
L418 is located between E13 and P401-2

R401 is located between V401-3 and GRD No. 2
R402 is located between E1 and GRD No. 2
R403 is located between V402-2 and E4
R404 is located between L404 Top and L406 Top
R405 is located between E2 and E3
R406 is located between V402-8 and L406 Top
R407 is located between L406 Top and L408 Top
R408 is located between E5 and E6
R409 is located between V403-8 and L408 Top
R410 is located between V404-2 and GRD No. 11
R411 is located between L408 Bottom and L410 Top
R412 is located between V403-2 and E7
R413 is located between L408 Top and L410 Top
R414 is located between V404-8 and L410 Top
R415 is located between L410 Top and L410 Bottom
R416 is located between V404-1 and GRD No. 10
R417 is located between L410 Top and E12
R418 is located between J402 and E11
R419 is located between V405-1 and GRD No. 14
R420 is located between E12 and L411 Top
R421 is located between V405-2 and GRD No. 13
R422 is located between V405-6 and GRD No. 13
R423 is located between V406-2 and V406-5
R424 is located between V406-1 and V406-7
R425 is located between V406-1 and J402
R426 is located between E4 and E7
R427 is located between E7 and E9
R428 is located between E2 and V402-1 and 3
R429 is located between V403-1 and 3 and E5
R430 is located between V406-2 and J404

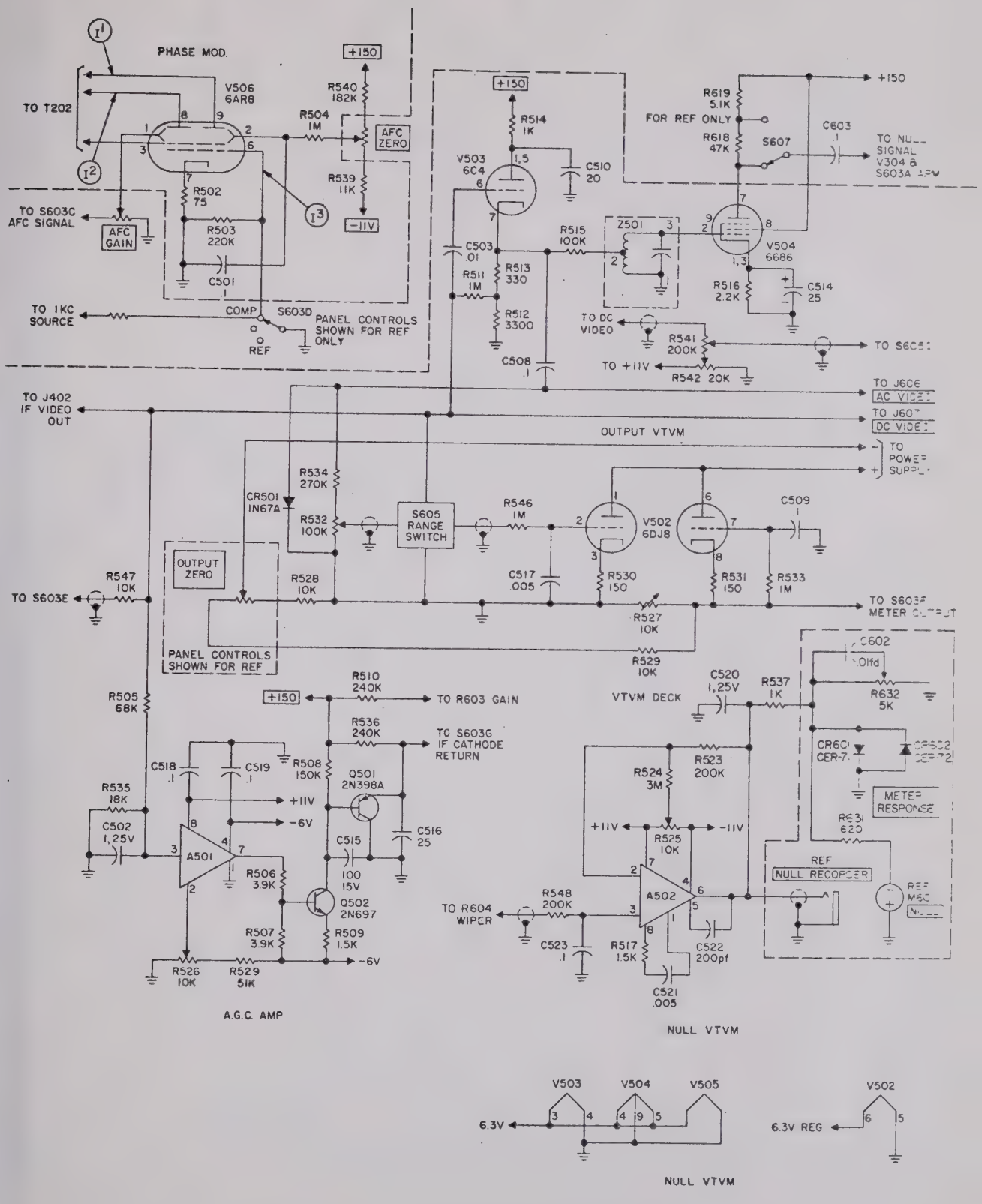
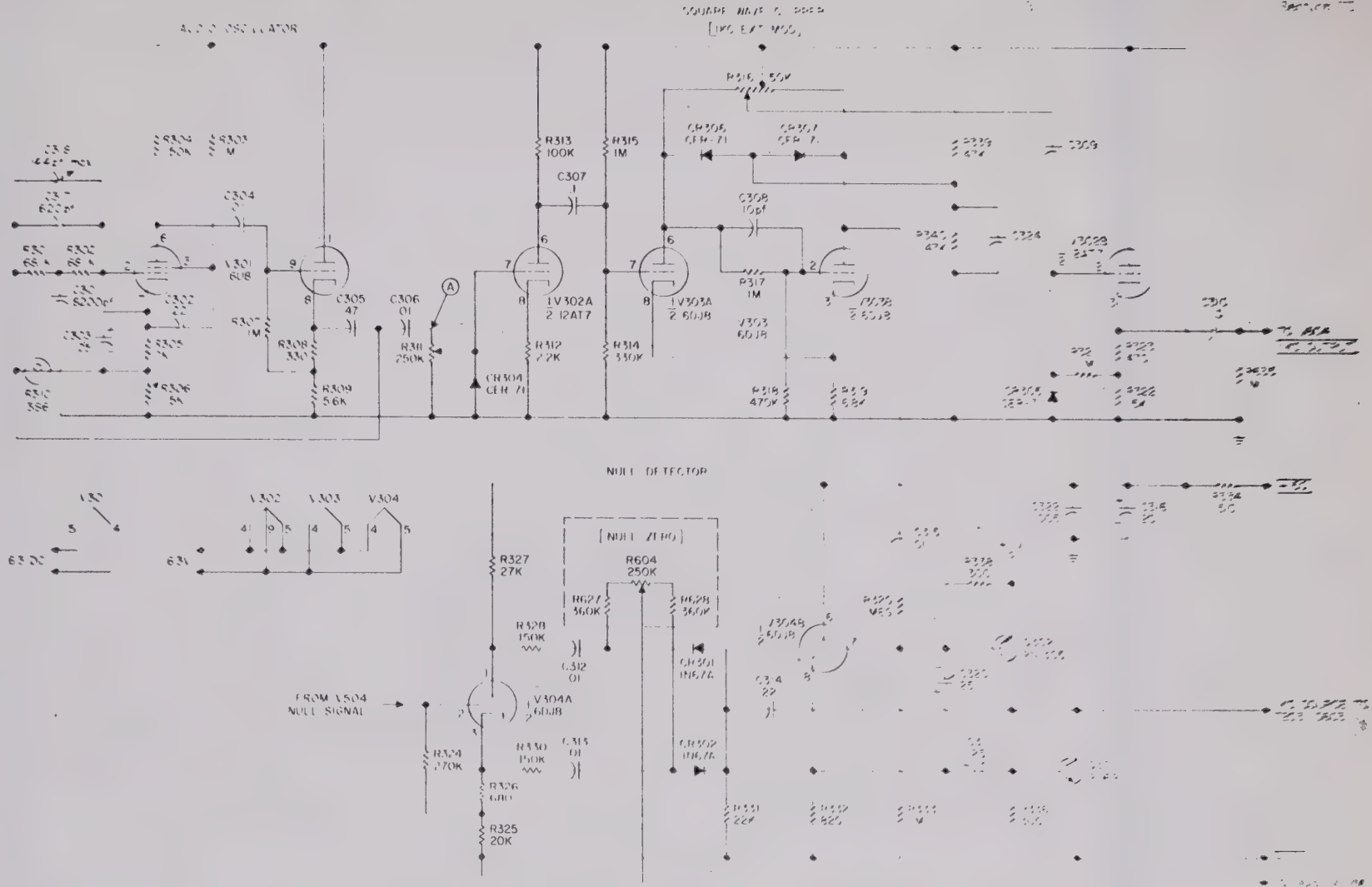


Figure 6-4. VTVM Deck Schematic Diagram


R313 100K
R315 1M
C307
C308 10pf
R316 50K
CR306 CER 7I
CR307 CER 7I
R317 1M
V303 6DJ8
R318 470K
R319 5.6K
C306 01
R311 250K
CR304 CER 7I
R312 22K
R314 330K
V302A 2 12AT7
V303A 2 6DJ8
C305 47
R307 1M
R308 330
R309 5.6K
C304
V301 6DJ8
R303 1M
R304 50K
C303
R305
R306 5K
C302
R302 68K
R301 68K
C301 .0022
C309
C310
R320 MEG
R321 470K
R322 470K
R323 5.6K
C311 .01
C312 .01
C313 .01
C314 22
R324 270K
R325 20K
R326 680
R327 27K
R328 150K
R330 150K
R331 22K
R604 250K
R627 360K
R628 360K
[NULL ZERO]
NULL DETECTOR
FROM V504 NULL SIGNAL
V304A 6DJ8
CR301 1N67A
CR302 1N67A
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Audio Oscillator and Null Detector
Component Locations

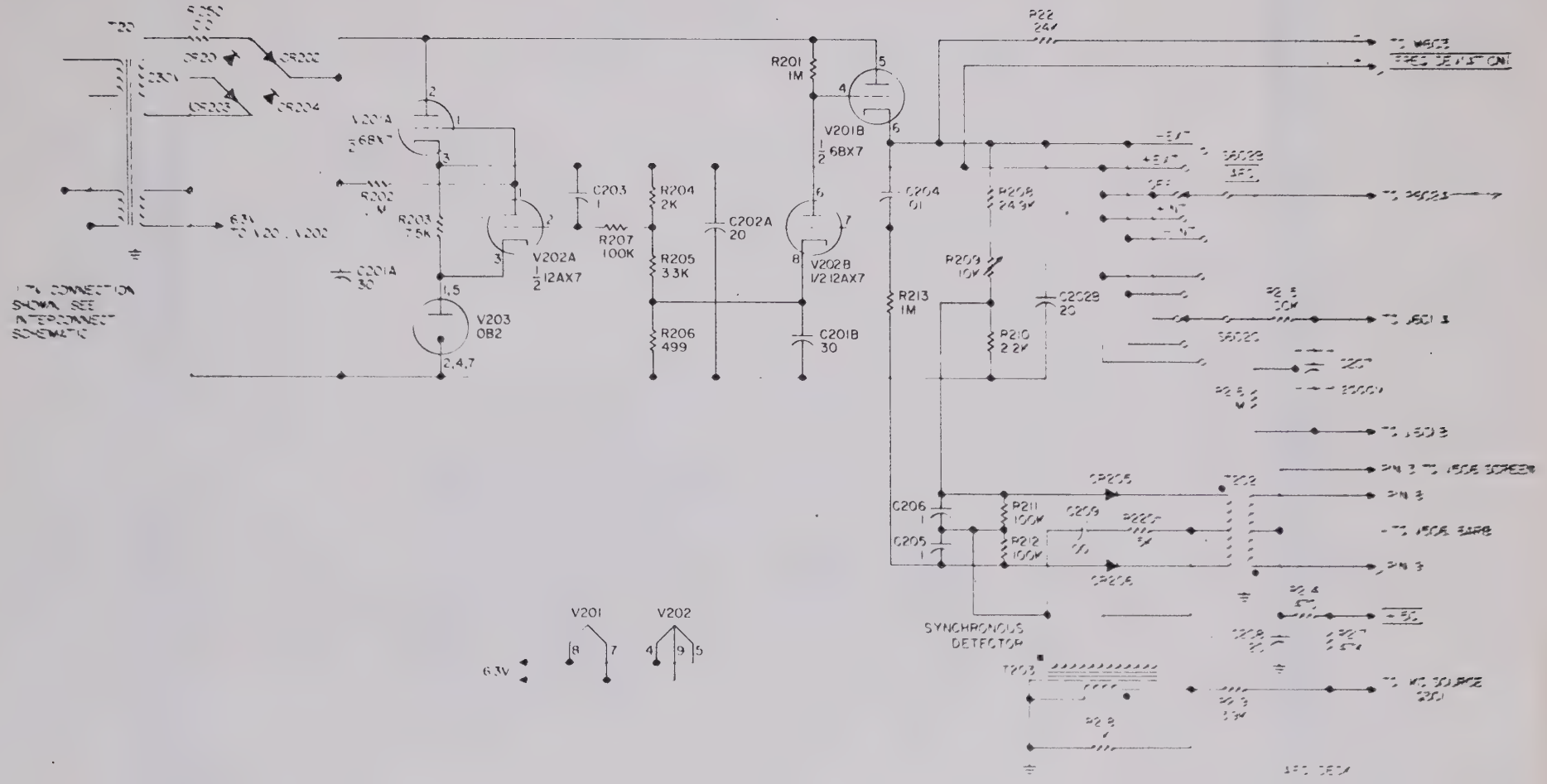
C324 is located between TB501-6 and TB501-7

CR306 is located between TB501-1 and TB501-2
CR307 is located between TB501-2 and TB501-3

R339 is located between TB501-6 and TB501-7
R340 is located between TB501-7 and TB501-8

C601 is located between B2 and B6

R601 is located between C9 and D8
R607 is located between A9 and B9
R608 is located between A7 and B8
R611 is located between A1 and A2
R612 is located between A1 and A12
R613 is located between A12 and A9
R614 is located between A9 and A11
R615 is located between A11 and A10
R617 is located between A8 and B7
R620 is located between TB3-15 to TB3-16
R623 is located between A1 and R622-3
R624 is located between A3 and R622-2
R626 is located between A2 and B3
R633 is located between A9 and C7
R634 is located between C10 and B12


R201
1M
V201B
1/2 6BX7
R202
.1M
R203
7.5K
V202A
1/2 12AX7
V202B
1/2 12AX7
C203
1
R207
100K
R204
2K
R205
33K
R206
499
C202A
20
C201B
30
C201A
30
V203
0B2
R213
1M
R210
2.2K
C202B
20
C204
.01
R208
24.3K
R209
10K
R211
100K
R212
100K
C206
1
C205
1
SYNCHRONOUS
DETECTOR
V201
V202
6.3V

C203 is located between C202-[illegible] and XV202-2
C204 is located between C202-[illegible] and XV202-7
C205 is located between TB203-2 and TB203-3
C206 is located between TB203-3 and TB203-4
C208 is located between TB202-1 and TB203-GRD
C209 is located between TB203-3 and TB204-3

CR201 is located between TB205-3 and TB205-4
CR202 is located between TB205-4 and C201-[illegible]
CR203 is located between TB205-3 and TB205-2
CR204 is located between TB205-2 and C201-[illegible]
CR205 is located between TB203-2 and TB203-1
CR206 is located between TB203-4 and TB203-5

R201 is located between XV201-4 and XV201-5
R202 is located between XV202-1 and XV201-2
R203 is located between C201-[illegible] and XV202-3
R204 is located between XV201-3 and E1
R205 is located between XV202-[illegible] and E1
R206 is located between C201-[illegible] and C201-GRD
R207 is located between XV202-2 and E1
R208 is located between XV201-6 and R209-3
R210 is located between XV203-7 and R209-2
R211 is located between TB203-2 and TB203-3
R212 is located between TB203-3 and TB203-4
R213 is located between XV202-7 and TB203-2
R214 is located between TB202-1 and TB202-5
R215 is located between TB204-2 and C207-2
R216 is located between C207-1 and C207-GRD
R217 is located between TB202-4 and TB202-5
R218 is located between TB201-1 and TB03-GRD
R219 is located between TB202-4 and TB201-1
R220 is located between TB204-1 and TB204-3
R221 is located between TB205-1 and XV201-6
R250 is located between TB205-4 and TB205-5

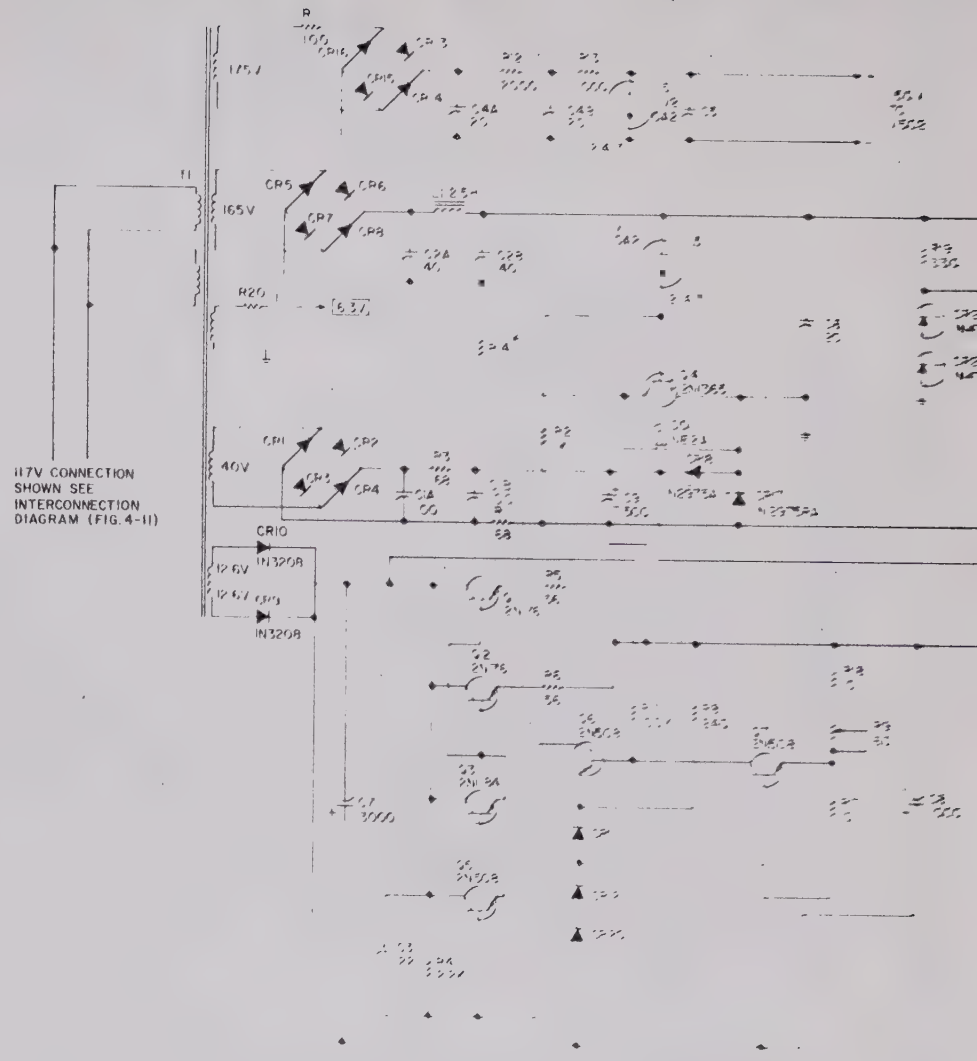
Power Supply
Component Locations

C5 is located between V2-1 and V2-7
C6 is located between TB4-1 and TB4-11
C9 is located between TB4-2 and TB4-12

CR1 is located between TB2-1 and TB2-2
CR2 is located between TB2-3 and TB2-4
CR3 is located between TB2-5 and TB2-6
CR4 is located between TB2-7 and TB2-8
CR5 is located between TB1-9 and TB1-10
CR6 is located between TB1-11 and TB1-12
CR7 is located between TB1-13 and TB1-14
CR8 is located between TB1-15 and TB1-16
CR13 is located between TB1-1 and TB1-2
CR14 is located between TB1-2 and TB1-6
CR15 is located between TB1-3 and TB1-5
CR16 is located between TB1-6 and TB1-5
CR21 is located between TB2-8 and TB3-4
CR22 is located between TB3-1 and TB3-2

DS1 is located between TB4-15 and TB4-16

R1 is located between TB2-13 and TB2-14
R2 is located between TB3-13 and TB3-14
R5 is located between TB2-11 and TB2-12
R5 is located between TB3-11 and TB3-12
R6 is located between TB3-9 and TB3-10
R11 is located between TB1-7 and TB1-8
R12 is located between C4 [illegible] and C4 [illegible]
R13 is located between C4 [illegible] and V2-5
R14 is located between TB4-13 and TB4-14
R15 is located between TB3-5 and TB3-6



narda Microline

THE NARDA MICROWAVE CORPORATION PLAINVIEW, L.I., NEW YORK 11803
516 - 433 - 9000

REQUEST FOR MAINTENANCE

FROM:

COMPANY _____ DATE _____

ADDRESS _____ NAME _____

_____ TITLE _____

DIVISION _____ TELEPHONE _____ EXT_____

_____

EQUIPMENT _____

MODEL _____ SER _____

REASON FOR REQUEST:

☐ Recalibration

☐ Unit not functioning properly

If for repair, describe trouble _____

_____

_____

_____

_____

_____

Is trouble localized? _____

If so, how and where? _____

_____

_____

_____

_____

_____

_____

_____

Is trouble intermittent? _____

Approximate hours of operation prior to failure _____

Date of failure _____

Was factory consulted by telephone or letter prior to this request? _____

If so, give date and name of person to whom directed _____

_____

_____

Additional Comments: _____

_____

_____

_____

_____

_____

_____

_____

When failure occurs requiring factory assistance, complete this form and send to:

The Narda Microwave Corporation
Plainview, L. I., New York 11803
ATTENTION: CUSTOMER SERVICE DEPARTMENT

After this request has been reviewed by the Customer Service Department, you will be contacted by the Company or the Sales Representative in your area. If it is required to ship the equipment back to the factory, we will notify you with instructions and authorization for returning the equipment.

NO EQUIPMENT MAY BE RETURNED TO THE FACTORY WITHOUT WRITTEN AUTHORIZATION.

PM6PLSN

5935-050-9432

PM6PLSH

9N 5935-00-284-3648 1.92

PM6PLSH

~~5935-00-235-XXXX~~

5544238 LITTON INDUSTRIES INC. 46A 0403 D 4-16-73

HIGH VOLTAGE

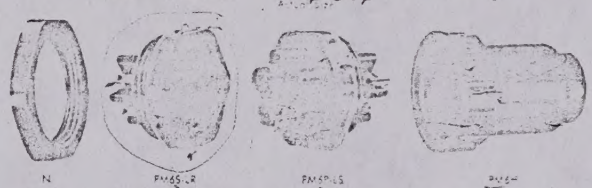
miniature connectors

5935-00-818-6860 9N 5935-00

9N 2.50 ~~741-0305~~ 201-4382 137-4302

~~814-3046~~ $2.01

Dimensions for reference only and are subject to change

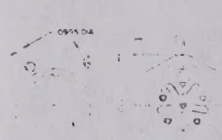


N
Nylon Nut

PM6S..R
Receptacle with lock ring

PM6P-LS
Plug with lock spring

PM6-
Boot



For the PM6: Di... ...ediately high voltage rating, mini... ...minimum bulk and weight par... ...quarts.

Specifications

Current Rating: 7.5 amps

No. Of Contacts: ...

Pin Contacts: ... dia. ...

Socket Contacts: ... bronze, gold plated

Terminations: ... tel...n 20 AWG stranded wire

Electrical Data: Di... withstanding voltage is one minute electrification at 3500 VAC

Dielectric: Molded melamine per MIL-M-14 MME

Polarization: Body design makes it impossible to make connection except in proper position.

Coste Or...

— PM6P-S...

Fi...

PM6P...

— PM6SLS—Conne... receptacle ... spring

Add R to code number for rear

Add N to code number for nylon nut

PM6P—Connector plug without ... lock

PM6S Connector receptacle without ... lock

ACCORING®

38610	YELLOW
38611	BLACK
38612	LIGHT BLUE
38613	DARK BLUE
38614	LIGHT GRAY
38615	LIGHT GREEN
38616	DARK GREEN
38617	TANGERINE
38618	RED
38619	EXECUTIVE RED

WITH WATER RESISTANT
PRESSTEX®
COVERS

ACCO INTERNATIONAL INC.
CHICAGO, ILLINOIS 60619